

# AA AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING  
ENGINEERING • PRODUCTION • MANAGEMENT

JANUARY 1, 1955

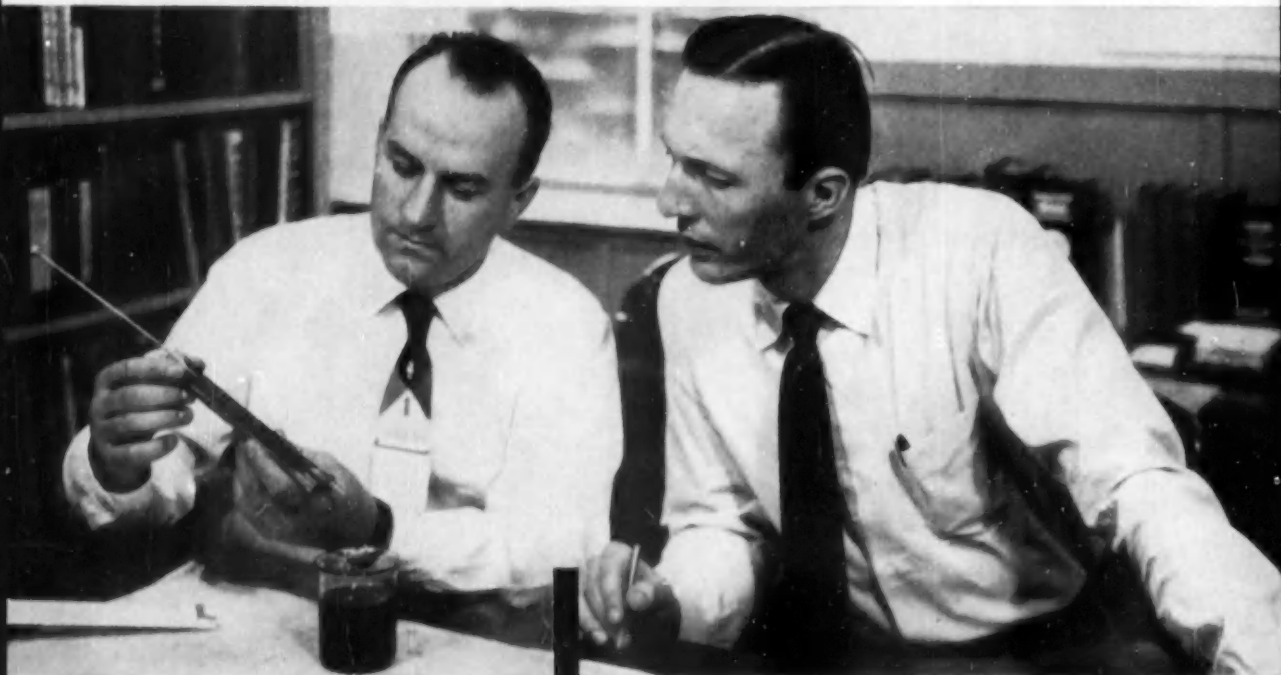
## *In This Issue*

Packard V-8's and Torsion Bar Suspension  
Efficient Use of General Purpose Tooling  
Continental's New Heavy Duty V-8 Engines  
Automation News Report as Special Feature  
New Features of '55 Nash and Hudson Models  
Automotive and Aviation Outlook for 1955

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A CHILTON PUBLICATION

# Seven years service for STANOIL Industrial Oil at David Bradley Mfg. Works —No down time for lubrication



L. R. Cummings (left), Standard lubrication specialist, inspects sample of STANOIL, with Robert C. Menken, Plant Engineer of David Bradley Manufacturing Works. Larry Cummings has been serving industrial customers for Standard Oil since graduation from Standard's Sales Engineering School. His mechanical engineering degree from Tri-State College of Indiana qualified him for this work. Customers of Larry's find this experience and background pay off for them.

David Bradley Tri-Trac, handy piece of farm equipment gives farmer new opportunity for mechanization at low cost. Upper frame on which gasoline tank is mounted, is part formed in HPM press.



Seven years ago David Bradley Mfg. Works installed 900 gallons of STANOIL Industrial Oil in an HPM press. There's been no down time required for lubrication maintenance since. A pump by-pass screen filter is the only filtering the oil receives, yet the system continues clean. In March, 1954, an analysis of the oil showed:

Viscosity @ 100° F. — 980  
Color, NPA — 6  
Neutralization No. — .11

STANOIL Industrial Oil has long been at work for Bradley. Successful operations with it in other equipment caused Bradley engineers to specify STANOIL for this installation.

The HPM double acting, fast traverse hydraulic press reported on here is used to draw the upper frames for the David Bradley Tri-Trac, compact farm tractor. The Tri-Trac is the newest implement in the Bradley line. Bradley has been making farm implements since 1832.

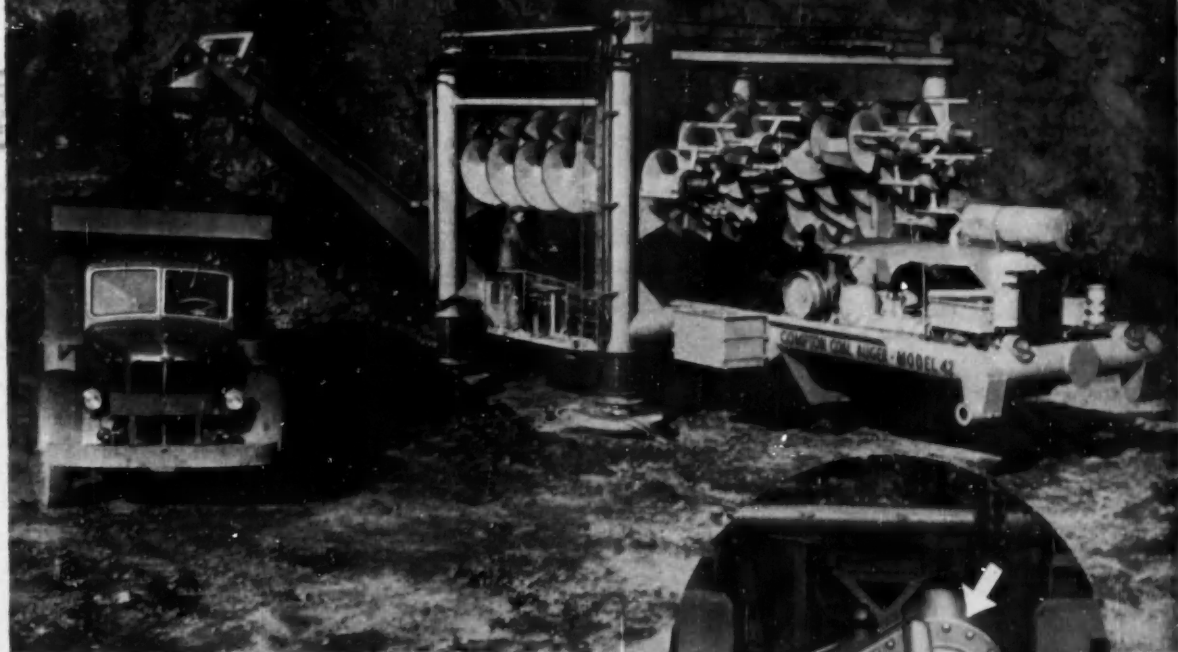
Like to know more about STANOIL? Perhaps it can serve you as efficiently as it is serving David Bradley. Lubrication specialists in any Standard Oil office will be happy to help. In the midwest, a call to one of them will bring a prompt response. Or contact: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



**STANDARD OIL COMPANY**  
(Indiana)



**Drives giant auger 200 feet into  
wall of solid coal!**



## **COTTA TRANSMISSION** takes heavy shock loads

**T**his is mechanized, highwall mining: drilling 200 feet into a wall of solid coal, using a 52" diameter auger . . . breaking up the coal and conveying 124 tons from each hole into a loading chute. The giant Compton Coal Auger, equipped with a special Cotta Transmission, does the job fast, at minimum cost per ton, with no time loss.

A mobile power unit furnishes the necessary thrust to force the auger and cutting head into the side of the strip. This is powered by a 300 h.p. diesel engine, capable of delivering 30,000 lbs. thrust at

45 rpm auger speed. The Cotta Transmission furnishes gear reduction required to meet extreme load conditions.

Cotta was specified because it has the stamina to stand up under heavy, intermittent shock loads. If you have an application on heavy equipment, such as cranes, locomotives, drillers, shovels, etc., with input torque from 150 to 2,000 foot pounds, Cotta engineers will help you select the right unit — standard or "engineered-to-order" — to give you outstanding performance at low cost.

### **THIS INFORMATION WILL HELP YOU**

Diagrams, capacity tables, dimensions and complete specifications sent free on request. Just state your problem—COTTA engineers will help you select the right unit for best performance. May we work with you?

**COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS**

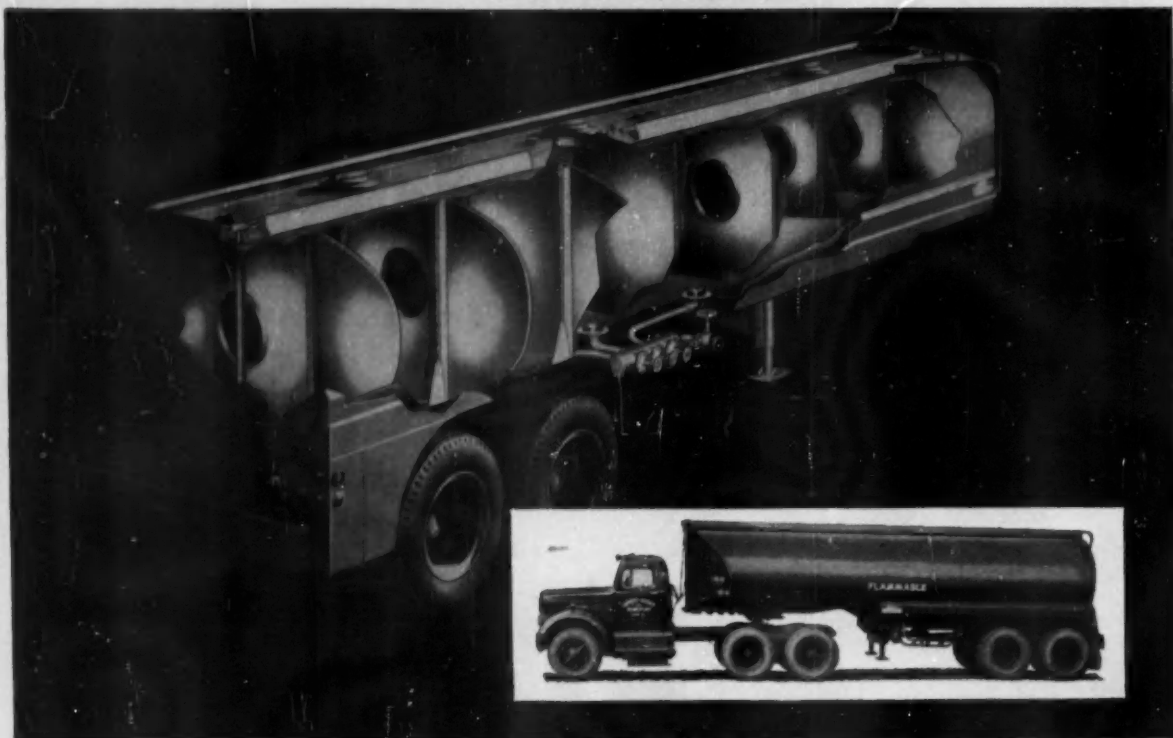


# **COTTA**

**HEAVY-DUTY  
TRANSMISSIONS**

**"Engineered-to-order"**

Cutaway illustration of "trailerized" tank for petroleum trailer manufactured by The Heil Co., Milwaukee, Wis. and Hillside, N. J., and utilizing "Mayari R," a high strength, low alloy nickel steel produced by Bethlehem Steel Co., Bethlehem, Pa.



Users of Heil "trailerized" tankers find that every pound of deadweight trimmed off not only saves fuel, but also lessens wear on tires and brakes. This means lower operating cost and higher revenue per ton mile.

## Nickel alloy helps designer eliminate trailer tank frame

**Payload increased and deadweight cut by utilizing high strength, low alloy steel containing nickel**

**SIMPLIFIED DESIGN** of this tanker eliminates not only the frame but also many supporting members ordinarily used in trailer tanks.

The manufacturer, The Heil Co., trims off 20 per cent in deadweight, yet increases the payload capacity of these units without sacrificing safety or increasing axle loading.

Capacity is safely increased by using tank shells, baffles, and deep-dished heads that have ample strength for the greater load because they are made of a high strength, low alloy steel containing nickel.

Heil uses a Bethlehem Steel Company product known as "Mayari R." Steels of this type in thin, light sections, provide the same strength and

safety as thicker, heavier sections of plain carbon steel. These steels also respond readily to fabrication, including welding and cold forming.

They give you other advantages, too. Their greater resistance to impact, wear and abrasion lengthens the life of structures subject to hard usage. And you get obvious benefits from the superior resistance they offer to atmospheric and many other types of corrosion.

Produced under a variety of trade names by leading steel companies, high strength, low alloy steels containing nickel along with other alloying elements are widely used in automotive and allied fields.

Investigate how you can cut needless weight, yet increase the payload capacity of your vehicles. Write us today for your copy of the publication "High-Strength Low-Alloy Steels."



**THE INTERNATIONAL NICKEL COMPANY, INC.** 67 Wall Street  
New York 5, N.Y.

A CHILTON MAGAZINE

PUBLISHED SEMI-MONTHLY

# AI

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JANUARY 1, 1955

VOL. 112, NO. 1

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MEMBER



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Audit Bureau  
of Circulations

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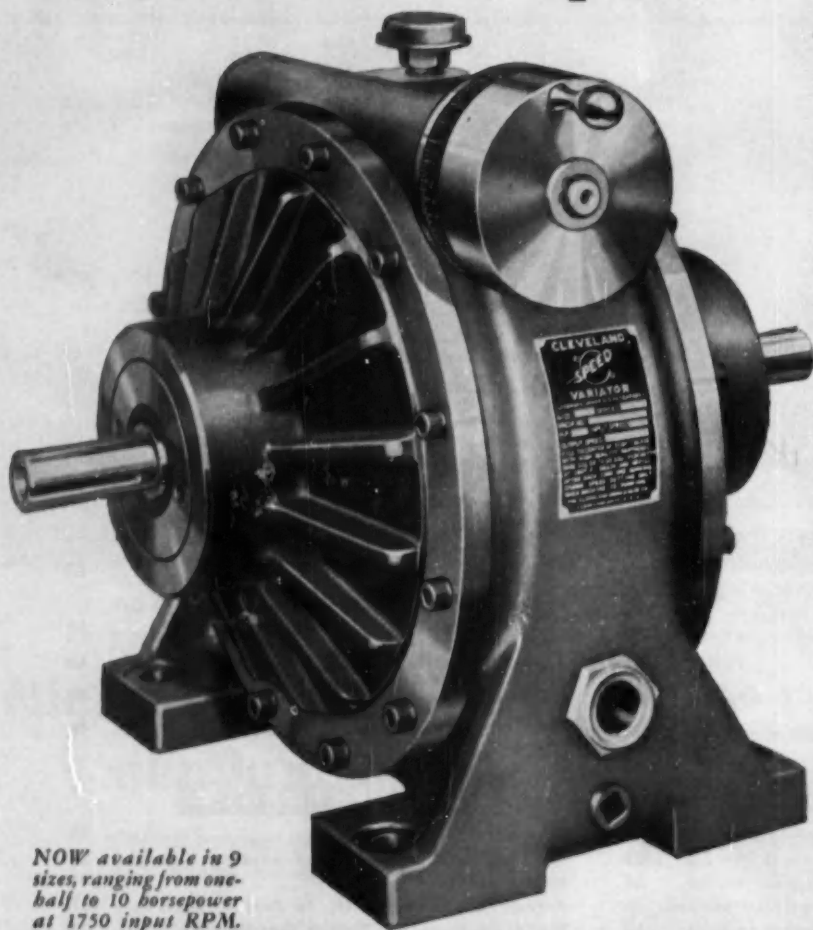
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Can you use a compact drive with infinitely variable speeds?

HERE IT IS

# Cleveland Speed Variator



NOW available in 9 sizes, ranging from one-half to 10 horsepower at 1750 input RPM.

**I**NFINITELY variable, stepless speeds within a 9:1 range (from  $\frac{1}{3}$  to 3 times the input speed).

Smooth, instant change of speed by simple manual adjustment or by remote control devices, either manual or power operated.

Operating efficiencies—75% to 90%.

Coaxial input and output shafts, rotating in same direction, either clock-wise or counter clock-wise.

Ample bearing support for both input and output shafts to carry overhung pulleys.

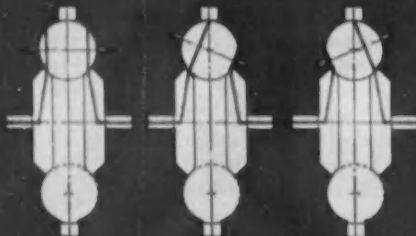
Compact and inherently quiet and smooth running, due to simple construction.

Minimum maintenance and long life, due to absence of belts and other complicated linkage.

Performance proved by prolonged tests in the laboratory and field operation.

These are the outstanding advantages of the Cleveland Speed Variator. It is now ready for service. Immediately applicable to a wide variety of machines and equipment where a dependable variable speed drive is required. For detailed description and specifications, write for Bulletin K-100.

## HOW THE CLEVELAND SPEED VARIATOR WORKS



Power is transmitted from input shaft to output shaft through alloy steel driving balls which are in pressure contact with discs attached to the two shafts.

Relative speeds of the shafts are adjusted by changing the positioning of axes on which the balls rotate (see diagrams, left, and cutaway view, right).



## THE CLEVELAND WORM AND GEAR COMPANY

Speed Variator Division, 3296 East 80th St., Cleveland 4, Ohio  
Sales Representatives in all major industrial markets



**Another new development using**

# **B. F. Goodrich Chemical** raw materials



*B. F. Goodrich Chemical Company does not make this bag. We supply only the Geon resin for the sheeting.*

## **Plastic windshield washer bag stops breakage**

**T**HERE'S nothing as annoying as a dirty windshield . . . and the automatic windshield washing system was designed to take care of this unsightly hazard. But the glass bottle holding the washing solution often breaks from a sudden impact or shatters from freezing weather. Now, this flexible washer reservoir developed by The Delman Company and made from Geon polyvinyl materials eliminates breakage.

The plastic container, fabricated from vinyl sheet and having a rigid vinyl neck, resists the effects of greases, oils, acids and other such substances found under the hood of an automobile. The new plastic bag can't be

harmed when hit accidentally with tools, bounce out and break from rough riding, or burst if the cleaning solution should freeze. Breakage during shipment to the automobile manufacturer also is eliminated.

The liquid level in the reservoir can be seen through the Geon vinyl panel which also provides a smooth surface for printing of instructions and other information.

Many more product improvements have come from the use of versatile Geon materials, in applications ranging from upholstery and flooring to electrical parts, rigid tubing, filters and sheeting. We'll gladly help you

select a Geon material to solve a tough problem or develop an idea. For technical information, please write Dept. BA-1, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.



**GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable.**  
**GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors**

# Proven producer

## SURVEY

### DESCRIPTION OF WORK:

Surfacing 24" square steel plates

### SEGMENTS:

Simonds NA36-J16-V (open structure)

### PERFORMANCE:

Gave fast, free-cutting action with long segment life. Eliminated excessive dressing

**INCREASED PRODUCTION 15%.**

**SIMONDS  
ABRASIVE CO.**

**abrasive  
segments**



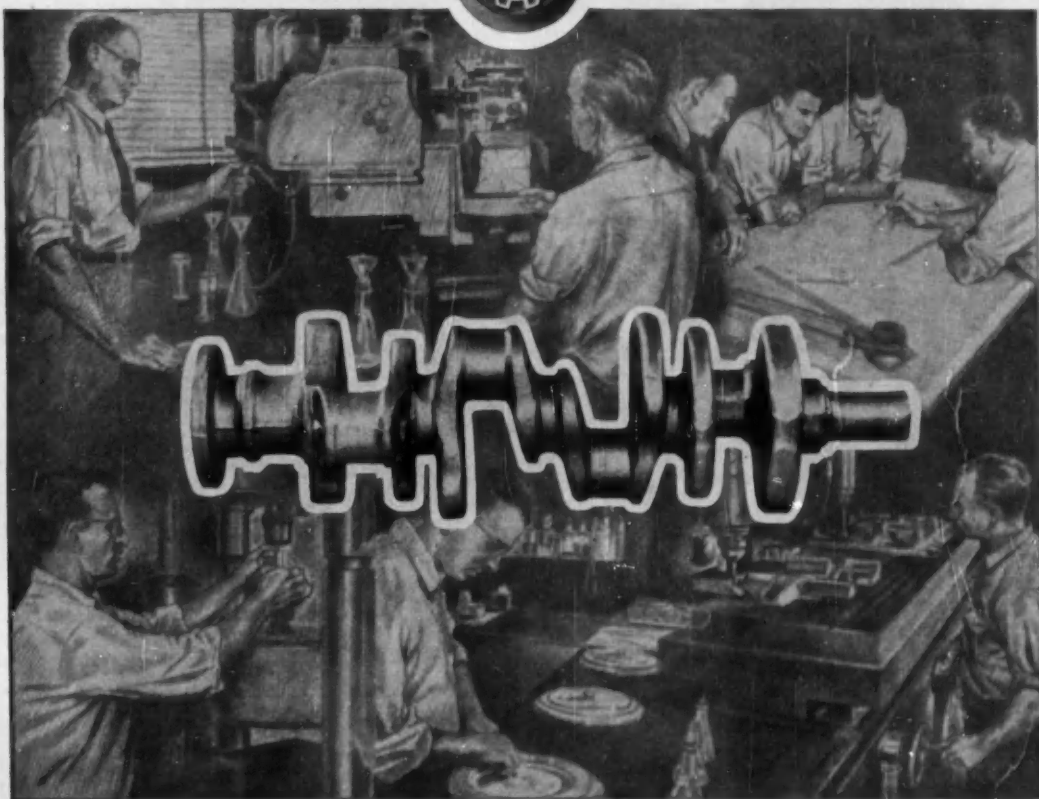
Send for catalog bulletin  
"Abrasive Segments" form ESA-168



Whatever your grinding job, there's a Simonds Abrasive product to help you do it better. Free consultation with our Engineering Service may reveal "profit leaks" in your present operations.

**SIMONDS ABRASIVE COMPANY • PHILADELPHIA 37, PA.**

Branch Warehouses: Boston, Detroit, Chicago, Portland, San Francisco • Distributors in Principal Cities  
Division of Simonds Saw and Steel Co., Fitchburg, Mass. • Other Simonds Companies: Simonds Steel Mills, Lockport, N.Y.,  
Simonds Canada Saw Co., Ltd., Montreal, Quebec and Simonds Canada Abrasive Co., Ltd., Arvida, Quebec



The crankshaft in the modern V-8 engine requires the ultimate in forging technique. Today's high compression engines, with continually increasing horsepower, further emphasize the importance of forging quality.

Wyman-Gordon technical know-how assures quality essential for maximum physical properties, uniform machinability and balance control . . . crankshaft forging specialists since the introduction of the internal combustion engine.

# WYMAN-GORDON

Established 1883

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL • TITANIUM

WORCESTER, MASSACHUSETTS

HARVEY, ILLINOIS

DETROIT, MICHIGAN



# Quenching Media for Alloy Steels

*This is the seventh of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.*

In the quenching of alloy steels, several points require consideration, among them being the size and shape of the piece, the type of steel involved, the quenching medium, and proper agitation of the quenching bath.

The composition of the steel has an important bearing on the selection of a quenching medium. As an example: shallow-hardening steels require a fast cooling rate, whereas deeper-hardening steels require progressively slower rates as the alloy content increases.

Three commonly used types of quenching media for alloy steels are water, oil, and air. These are discussed below in the order of quenching severity: **(1) WATER.** Fresh water is entirely satisfactory only when used as a flush. Salt-water solutions are generally used in still baths to avoid the bad effect of bubbles resulting from dissolved atmospheric gas. It should be noted that the quenching rate drops as water temperature is increased. The range of 70 deg to 100 deg F is recommended.

**(2) OIL.** An oil quench cools more slowly than water, and faster than air. Oil-hardening steels can be hardened with less distortion and greater safety than water-hardening steels. Mineral oils are generally used because of their low cost and relatively stable nature.

**(3) AIR.** If sufficient alloying elements are present, critical cooling rates are decreased to the extent that certain steels can be quenched in either still or forced air.

While the choice of quenching medium is of prime importance, there is another factor that should not be overlooked. This is the agitation of the quenching bath. The more rapidly the bath is agitated, the more rapidly heat is removed from the steel, and the more effective the quench.

Bethlehem metallurgists will gladly help you with any problem related to quenching or other phases of heat-treatment. They are men of long practical experience in this field, and they understand fully the advantages and limitations of each method. Always feel free to call for their services; their time is yours, without obligation.

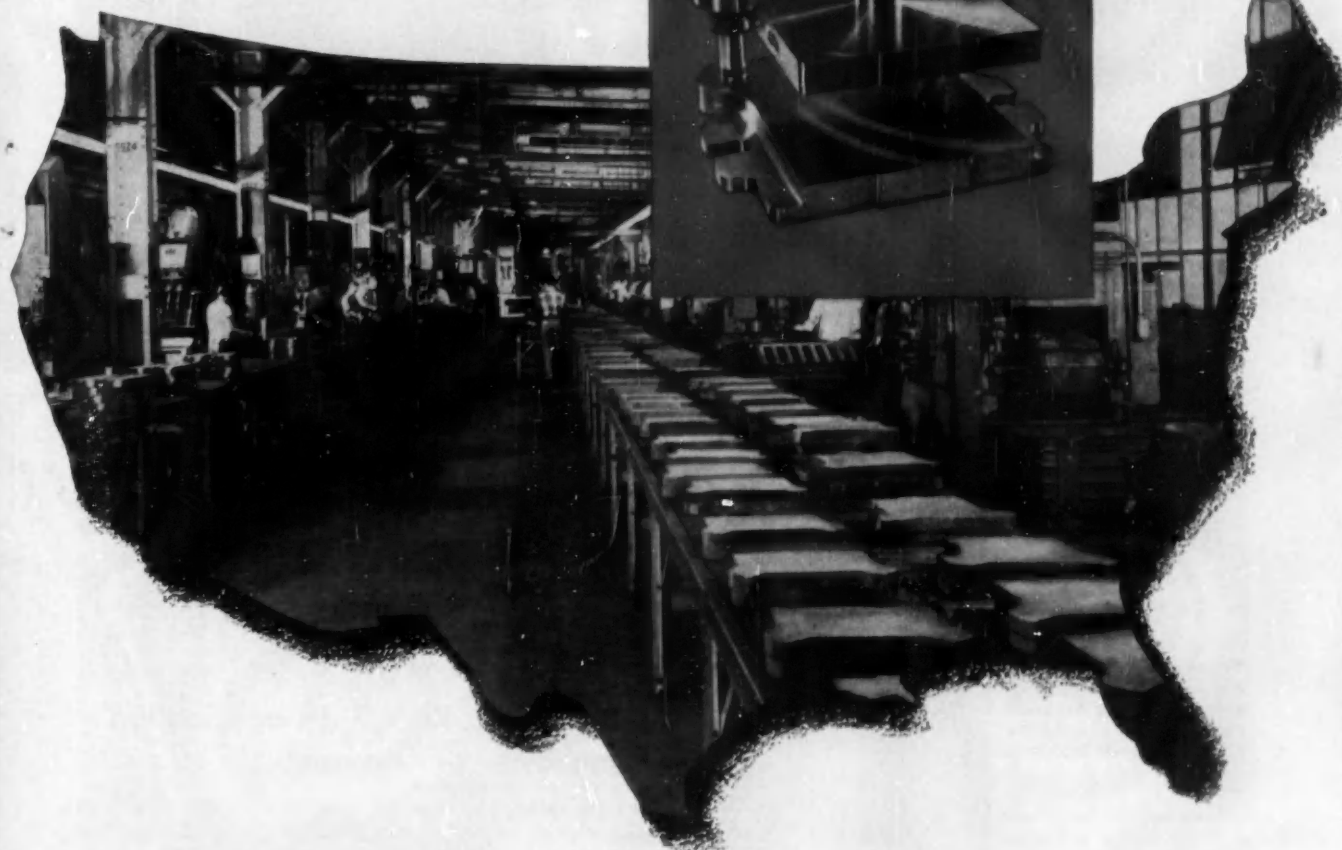
Remember Bethlehem, too, when you are next in the market for AISI standard alloy steels, special-analysis steels, or carbon grades. We are always in a position to meet your needs promptly.

**BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.**  
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

## BETHLEHEM *ALLOY* STEELS







## *Here's the "how" of the fastest Die Set Service ever*



### **Which Danly Branch is closest to you?**

<b>BUFFALO</b> 7	1807 Elmwood Avenue
<b>CHICAGO</b> 50	2100 S. Laramie Avenue
<b>CLEVELAND</b> 14	1550 East 33rd Street
<b>DAYTON</b> 7	3196 Delphos Avenue
<b>DETROIT</b> 16	1549 Temple Avenue
<b>GRAND RAPIDS</b>	113 Michigan Street, N.W.
<b>INDIANAPOLIS</b> 4	5 West 10th Street
<b>LONG ISLAND CITY</b> 1	47-28 37th Street
<b>LOS ANGELES</b> 54	Ducommun Metals & Supply Co., 4890 South Alameda
<b>MILWAUKEE</b> 2	111 E. Wisconsin Avenue
<b>PHILADELPHIA</b> 40	511 W. Courtland Street
<b>ROCHESTER</b> 6	33 Rutter Street
<b>ST. LOUIS</b> 8, Mo.	3740 Washington Blvd.
<b>SYRACUSE</b> 4	2005 West Genesee Street

**FIRST**, Danly is able to apply mass-production efficiency in manufacturing high precision, *interchangeable* die set components to the traditional Danly quality standards. **SECOND**, each Danly Branch is stocked with thousands of these *interchangeable* die set components, for immediate assembly to meet your tooling requirements. **THIRD**, Danly Branches are strategically located throughout the United States in major toolmaking centers to give you quick, local delivery. So, when you want the finest die sets in the shortest time . . . just call your nearby Danly Branch.

### **DANLY MACHINE SPECIALTIES, INC.**

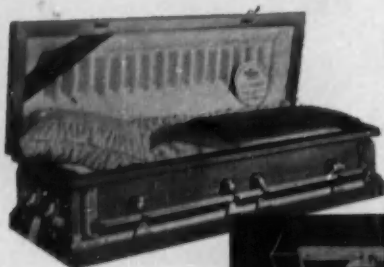
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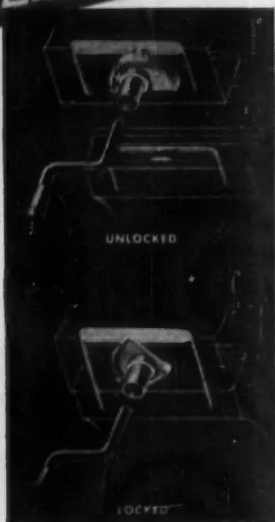
DIE SETS  
STANDARD OR SPECIAL  
DIEMAKERS' SUPPLIES

# "Nothing can go wrong with Roto-Lock performance"

**S**ays Elgin Metal Casket Company



Roto-Lock operation is simple: Serrated, tapered cam engages latch — draws panels tightly together when turned by crank or other hand tool.



Simmons Roto-Lock Fasteners are used by Elgin Metal Casket Co., of Elgin, Illinois, to give its Perma-seal Caskets a perfect hermetic seal against air and water. Drawn down with a pressure of up to 1500 lbs., Roto-Lock guarantees an absolutely tight seal and strength far beyond requirements.

President E. B. Stewart of Elgin says: "Roto-Lock worked out particularly well because of the simplicity of its construction, and the fact that it was a lock already in a housing which could readily be sealed. Functionally the lock is very good since it pulls the lid down with ease and is a quick-operating mechanism. In other words, the locking and sealing operation can be accomplished quickly and easily in a matter of seconds. Since the whole locking and sealing mechanism contains only one moving part, there is nothing that can go wrong with the performance of the lock. Of course, this is important since mal-function at a funeral service would be a serious matter."

## and there's a Roto-Lock application to improve your product

Roto-Lock, which makes butt or right-angle joints quickly, is finding wide application in portable shelters, air freight and cold storage shipping containers, walk-in coolers, demountable furniture and scaffolding. It fastens in any misaligned or semi-open position and recesses completely into panels. *Wherever* demountability is important, there's a Roto-Lock application.

Write today for our 36-page catalog. It's filled with applications of Roto-Lock and Simmons' four other special fasteners engineered to improve products and reduce assembly costs.

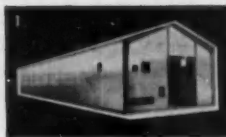
**SIMMONS FASTENER CORPORATION**

1749 N. Broadway, Albany 1, New York

# Simmons

QUICK-LOCK • SPRING-LOCK • ROTO-LOCK • LINK-LOCK • DUAL-LOCK

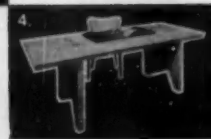
**FASTENERS WITH USES UNLIMITED**



Some applications of Roto-Lock:

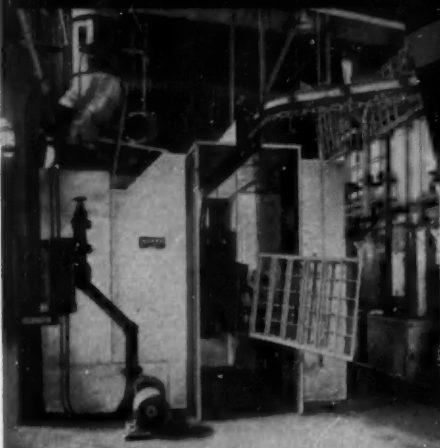


1. Portable Shelter
2. Partition
3. Demountable Refrigerator Unit
4. Demountable Desk

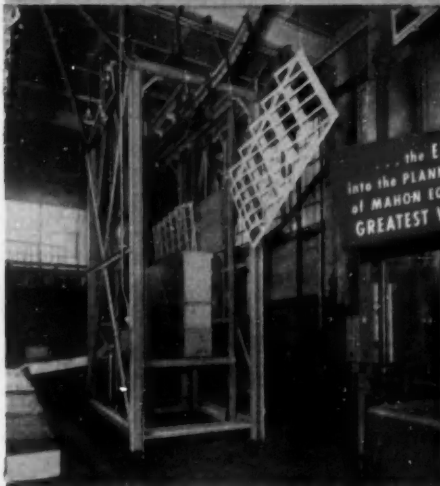


# COMPLETE *Finishing* SYSTEMS

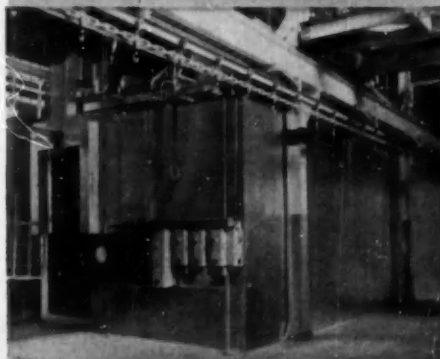
... for ENAMELS • LACQUER • PAINT • VARNISH



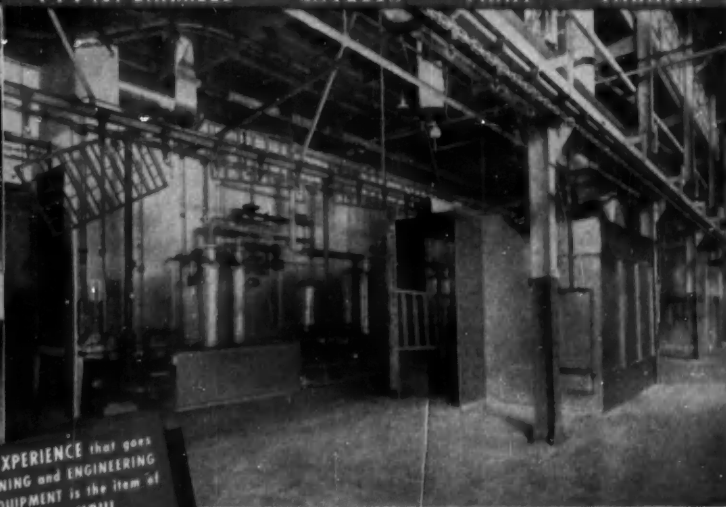
Mahon Hydro-Filter Spray Booth—part of the Complete Mahon Finishing System installed for Color-Craft, Inc.



Mahon Automatic Dip-Coating Machines at Color-Craft, Inc. Dip tanks employed vary in size to meet job requirements.



Mahon Finish Baking Oven—part of the Complete Mahon Finishing System installed for Color-Craft, Inc., Detroit, Mich.



General view of the Complete Mahon Finishing System at Color-Craft, Inc. Facilities include Six-Stage Metal Cleaning and Rust Proofing Equipment.

... the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the item of GREATEST VALUE to YOU!

## COLOR-CRAFT, Inc. Chooses MAHON EQUIPMENT for High-Quality CONTRACT PAINTING OPERATIONS!

When the Color-Craft organization in Detroit decided to go into the contract painting business, the two most convincing points in selling this painting service to manufacturers were Color-Craft's know-how, backed by over twenty-five years of experience, and new, modern processing and coating equipment and other facilities capable of producing at minimum cost the fine finishes demanded in today's highly competitive market. Color-Craft turned to Mahon for the type of equipment deemed necessary for a successful and profitable operation. Mahon planned, engineered, built and installed a complete finishing system flexible in its cleaning and pre-paint processing of metals and capable of handling the wide variety of shapes and sizes in parts and products encountered in this type of finishing operation. The choice of Mahon Equipment was not only a wise decision, but a logical one in this case, because more automobiles and more home appliances are finished in Complete Mahon Finishing Systems than all other types combined—an indisputable tribute to Mahon's performance in this highly specialized field. If you are contemplating new finishing equipment, you, like thousands of other quality-minded manufacturers, will find that Mahon engineers are better qualified to advise you on both methods and equipment requirements ... and better qualified to do the all-important planning, coordinating and engineering of equipment—which is the key to fine finishes at minimum cost. You will find also, that Mahon equipment is built better for more economical operation over a longer period of time. Mahon will furnish your complete system on one contract ... undivided responsibility for the entire job safeguards you against complications which may upset your production plans and subsequent schedules. See Sweet's Plant Engineering File for information, or write for Mahon Catalog A-655.

### THE R. C. MAHON COMPANY

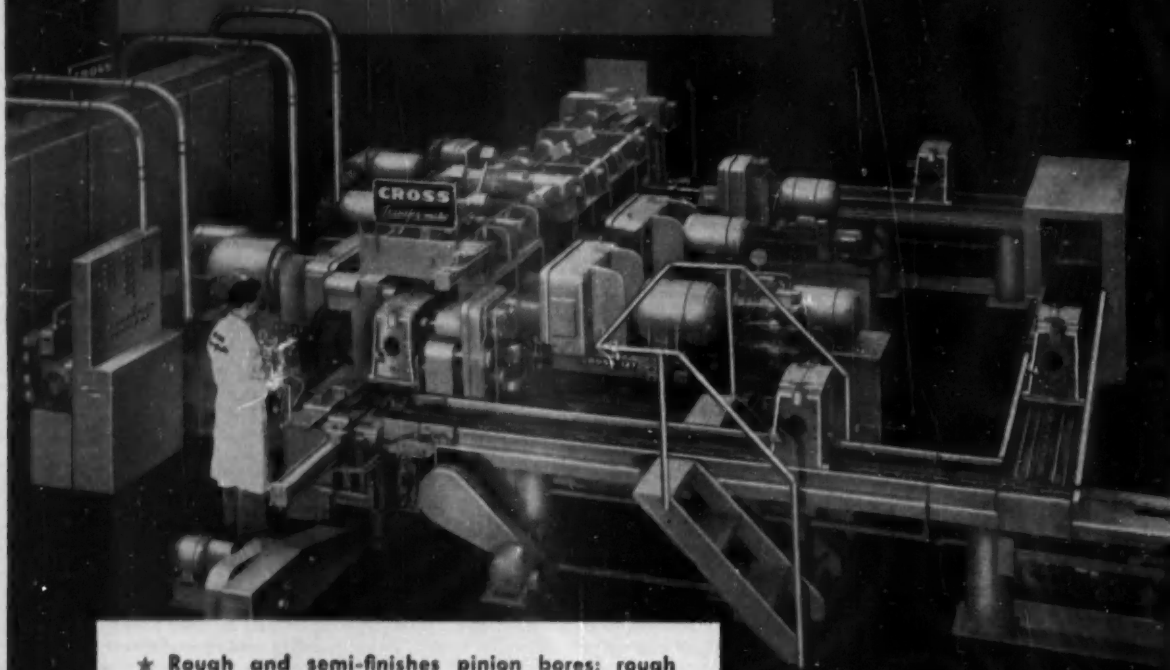
HOME OFFICE and PLANT, Detroit 34, Mich. • WESTERN SALES DIVISION, Chicago 4, Ill.

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning, Pickling, and Rust Proofing Equipment, Hydro-Filter Spray Booths, Dip and Flow Coaters, Filtered Air Supply Systems and Drying and Baking Ovens, Coating Tunnels, Heat Treating and Quenching Equipment for Aluminum and Magnesium, and other Units of Special Production Equipment.

# MAHON

*Another Transfer-matic by Cross*

## Machines Rear Axle Differential Gear Housings



- ★ Rough and semi-finishes pinion bores; rough bores, semi-finish bores and taps cross bores.
- ★ 155 parts per hour at 100% efficiency.
- ★ 9 stations—1 for loading, 4 for boring, 1 for tapping, 2 for indexing, 1 for visual inspection.
- ★ Pallet-type work holding fixtures.
- ★ Hydraulic power wrench for clamping parts.
- ★ Automatic transfer of fixtures from station to station.
- ★ Other features: Complete interchangeability of all standard and special parts for easy maintenance; construction to J.I.C. standards; hardened and ground ways; tandem drive for locating pins; hydraulic feed and rapid traverse; automatic lubrication; oil-mist lubrication for taps; drag-chain type chip conveyor.



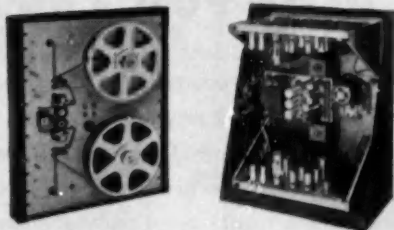
Established 1898

THE **CROSS** CO.  
DETROIT 7, MICHIGAN  
*Special* MACHINE TOOLS



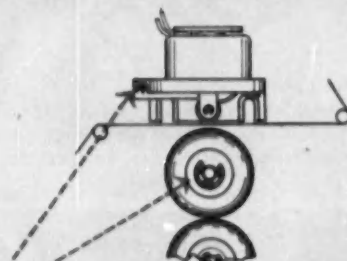
# 30 Waldes Truarc Rings Save Space and Time... Simplify Assembly and Disassembly

## Potter's New Digital Magnetic Tape Handler



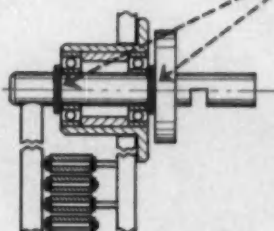
■ Prime requirements: fast starts, fast stops, fast tape speeds, great accuracy. Using Truarc rings, this new model starts and stops the tape within 5 milliseconds, has tape speeds up to 60 inches per second.

## Solenoid Mount and Capstan Assembly



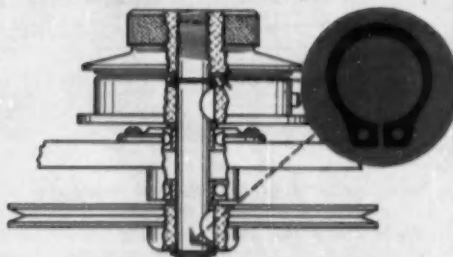
■ Miniature Truarc E-Rings on .040 diameter shaft and on continuously running capstans eliminate projecting bolts and screws. Rings permit rapid assembly and disassembly, fast replacement of worn rubber capstans.

## Tension Shaft Assembly



■ Truarc E-Rings snap quickly into place, act as shoulders for the ball bearings with a minimum of friction. Additional Truarc Rings are used as spacers on shafts, can be located accurately to extremely close tolerances.

## Reel Shaft Assembly



■ Truarc Standard Rings (Series 5100) hold the reel shaft assembly firmly in place and permit the use of quick-lock hubs so that the reel tapes can be changed in seconds as they are finished.

Potter Instrument Company, Inc., of Great Neck, L. I., uses 30 Waldes Truarc Retaining Rings in their new Model 902 High Speed Digital Magnetic Tape Handler. In addition to solving a variety of fastening problems, Truarc Rings facilitate the rapid acceleration and fast stopping needed in these machines.

Wherever you use machined shoulders, bolts, snap rings, cotter pins, there's a Waldes Truarc Retaining

Ring designed to do a better, more economical job. Truarc Rings are precision engineered, quick and easy to assemble and disassemble. They save time and increase operating efficiency.

Find out what Waldes Truarc Retaining Rings can do for you, toward saving costs and improving your product. Send your blueprints to Waldes Truarc Engineers for individual attention without obligation.



SEND FOR NEW CATALOG

# WALDES TRUARC

REG. U. S. PAT. OFF.

## RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2,392,927; 2,392,940; 2,410,052; 2,430,921; 2,430,941; 2,430,780; 2,441,040; 2,430,193; 2,482,380; 2,482,383; 2,487,802; 2,487,803; 2,491,305; 2,509,081 AND OTHER PATENTS PENDING

For precision internal grooving and undercutting...Waldes Truarc Grooving Tool!



Waldes Kohinoor, Inc., 47-16 Astor Pl., L. I. C. 1, N. Y.  
Please send me the new Waldes Truarc Retaining Ring catalog.

(Please print)

Name .....

Title .....

Company .....

Business Address .....

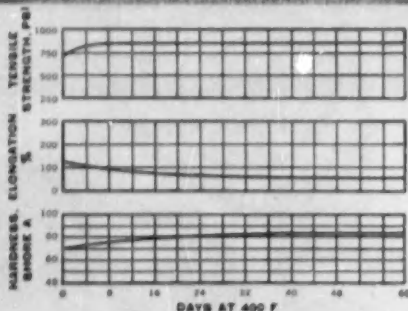
City..... Zone..... State.....

## CLASS 300 (LOW COMPRESSION SET)



Absolute minimum compression set at ordinary and elevated temperatures. Ideal for O-rings, seals, gaskets. More "come-back" than any known rubber!

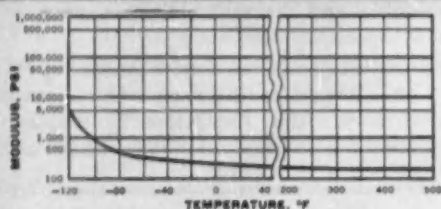
## CLASS 400 (GENERAL PURPOSE)



Typical effects of oven aging on physical properties of a Class 400 general purpose stock.

Most economical class, providing typical silicone rubber properties for gaskets, seals, O-rings, sleeves, boots, bellows, tubing, belting, shock mounts.

## CLASS 500 (EXTREME LOW TEMPERATURE)



Effect of temperature on flexibility of a typical Class 500 Extreme Low Temperature stock. (Young's Modulus in Flexure)

Flexibility and recovery from compression down to -120°F. Ideal for high-altitude flight applications where low-temperature flexibility is vital.

G-E silicones fit in your future

**GENERAL  ELECTRIC**

# Which class of G-E SILICONE RUBBER IS BEST FOR YOU?

General Electric silicone rubber is classified according to dominant property to make it easy for you to select and specify the right silicone rubber for the parts you need. You can be sure of more exact performance when you choose among the many classes of G-E silicone rubber.



Send today for free "Lightning Selector"! This handy chart makes it quick and easy for you to select and specify the best G-E silicone rubber for your job.

(General Electric Company  
Section 51-18  
Waterford, New York)

Please send me product data on G-E silicone rubber, including a free "Lightning Selector" and up-to-date list of fabricators. I am chiefly interested in:

- |                                      |                                      |
|--------------------------------------|--------------------------------------|
| 1 ( ) Molded gaskets, bushings       | 9 ( ) Extruded seals, tubing         |
| 2 ( ) O-rings                        | 10 ( ) Reinforced ducting, hose      |
| 3 ( ) Molded boots, sleeves, bellows | 11 ( ) Sheets and blankets           |
| 4 ( ) Shock mounts                   | 12 ( ) Rubber bonded to metal        |
| 5 ( ) Rubber-covered rolls           | 13 ( ) Die-cut gaskets               |
| 6 ( ) Belting                        | 20 ( ) Wire and cable insulation     |
| 8 ( ) Sponged products               | 30 ( ) Coated tapes, cloths, sleeves |

Name \_\_\_\_\_ Position \_\_\_\_\_

Firm \_\_\_\_\_

Street \_\_\_\_\_

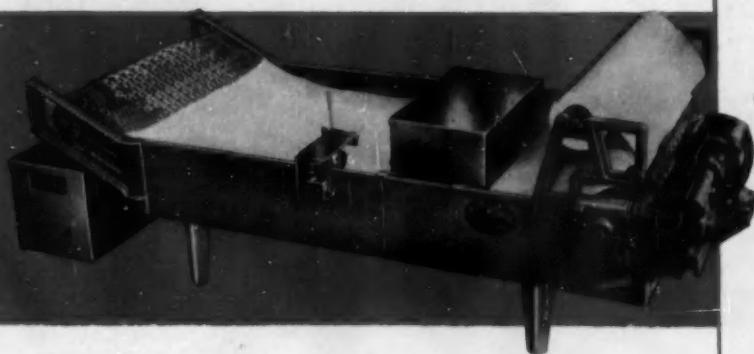
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IN CANADA: Mail to Canadian General Electric Company, Ltd., Toronto

# Delpark

## FILTERS SAVE

NEARLY **\$4,000,000\***  
ANNUALLY  
On Grinding Operations



The savings made by DELPARK Filters in grinding operations is one of the outstanding developments in industrial cost reduction. DELPARK Filters are saving industry more money than any other production line liquid filter.

On grinding operations particularly, actual costs and savings pin point the importance of DELPARK coolant filtration in increased profits.

Today there are more than 3,000 DELPARK Filters in use in American industrial plants. Here is added proof of the wide acceptance, and recognized importance of DELPARK filtration in industry. If your applications are coolant, quench oil or any of the other industrial liquid filtration problems, DELPARK engineers can help you.

*Backed by more than 40 years experience in industrial filtration problems.*

# Delpark

INDUSTRIAL  
FILTRATION

\* Based on \$1754.55  
per filter savings shown  
in the 4-page brochure  
illustrated below



GET THE FACTS AND FIGURES ON  
THIS TERRIFIC SAVINGS STORY.  
WRITE FOR THIS 4-PAGE BULLETIN.



## A black and white photograph of a dark, textured surface, possibly a book cover or endpaper. Several overlapping, dark, circular or oval shapes, resembling stones or pebbles, are arranged diagonally across the frame. The largest stone is at the top right, with smaller ones below and to the left. The background is a dark, mottled grey.

*Page Number* 100/100

For more information, contact:

Let Mallory welding engineers help you choose the type of wheel that your specific application requires. And write today for your copy of the latest Mallory Resistance Welding Catalog... or get one from your local Mallory distributor.

**P. R. MALLORY & CO. Inc.**  
**MALLORY**

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

*In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry Street, Toronto 15, Ontario*

Hundreds of shapes and sizes are available in stock... with round water holes or the exclusive Mallory fluted cooling hole for longer life between dressings. Save you both cost and delivery time.

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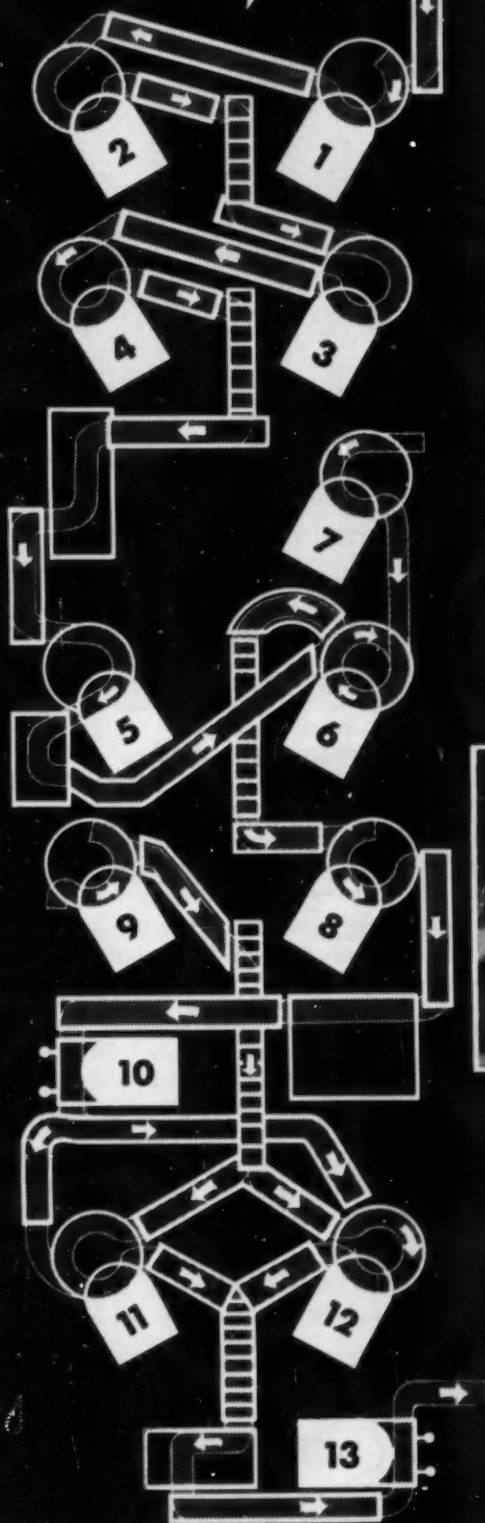
Odd-shaped electrodes you consider "specials" may well be standard items for Mallory... can be made quickly with existing tools, in a wide range of single-bend, double-bend and irregular shapes.



For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio



ASSEMBLY LINE WITH  
13 DENISON MULTIPRESSES



Assembles  
13,000 auto door-locks  
per day with

## DENISON MULTIPRESS®

**T**HIS COMPANY set out to assemble 10,000 auto door-locks per 16-hour day . . . beat its goal by 3000 with Denison Multipress.

With a line of 13 Denison hydraulic Multipresses, Reid Products Division of The Standard Products Company assembles 13,000 door-locks . . . 34 pieces per lock.

Parts are carried on conveyors and chutes.

Operators load component parts on Denison Index Tables which position them under the hydraulic ram up to 70 times a minute.

Assembly line takes up only 500 square feet.

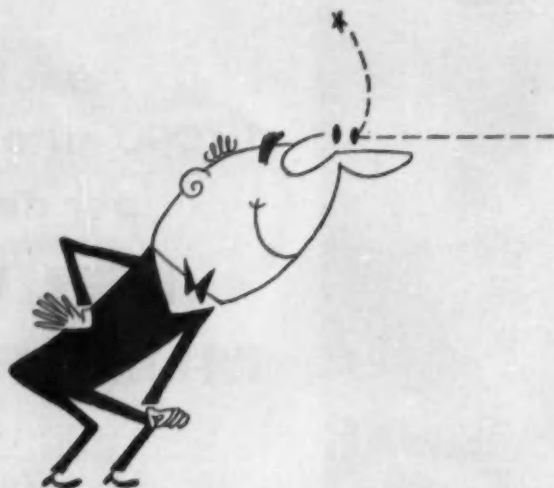
If you have a problem in automatic operation. . . or any job that

*Loading for staking of  
five-part sub-assembly*

calls for controlled pressures up to 75 tons, bring it to Denison. Write to:

**THE  
DENISON ENGINEERING COMPANY**  
1212 Dublin Road • Columbus 16, Ohio

**DENISON**  
*Hydraulics*



## There's more than meets the eye- in Honeywell instrumentation

**S**PECIALIZED Application Engineering is one of the most important extra values you get in Honeywell instrumentation. Although it's unseen, it's a vital part of your measuring and controlling equipment . . . for it's what assures you of getting most effective utilization of the instrument performance that you buy.

Here's how this service works for you. First, a Honeywell field man sits down with your engineers, production men and instrument technicians. He digs out the facts about your process . . . finds out what needs to be measured or controlled, to what accuracy, under what conditions.

Then Honeywell's Application Engineering staff gets the problem. This group includes men who have first-hand experience in the instrumentation technology of a particular industry. Some specialize in chemical processing . . . others in metal-working . . . others in petroleum. Together they add up to an unequalled storehouse of knowledge on how to use modern instrumentation in modern production. They engineer your complete system . . . including not only the selection of instruments, primary elements and controls, but also the accessory switches, signals and interlocks that add distinctive features of convenience and safety.

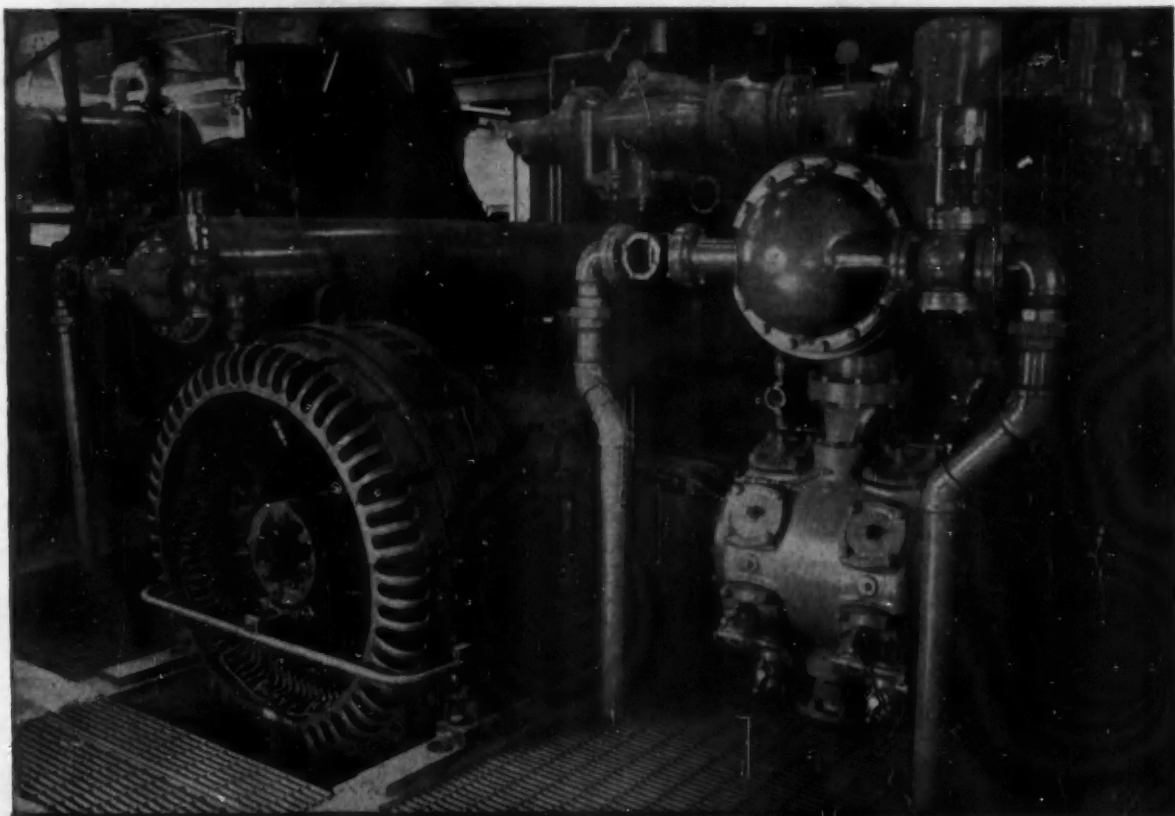
Honeywell Application Engineering takes a big burden off your own engineering staff. And it pays dividends in performance that spells real production economy, consistent quality and simplified maintenance.

MINNEAPOLIS-HONEYWELL REGULATOR Co., *Industrial Division*,  
Wayne and Windrim Avenues, Philadelphia 44, Pa.



MINNEAPOLIS  
**Honeywell**  
BROWN INSTRUMENTS

*First in Controls*



## CLARK BALANCED/OPPOSED COMPRESSOR

### Used for testing jet components in Bendix Aviation's new research center

Speeds up to supersonic levels! Atmospheric conditions ranging from sea level to 80,000 feet! Temperatures from minus 100° F. to plus 800° F. These are the conditions at which Bendix Aviation Corporation's new research facility at Teterboro, N. J. can test component equipment for jet aircraft and missiles.

Destined to save thousands of man-hours of engineering research, the new facility utilizes the latest combinations of pneumatic and electrical equipment. Playing an important part is a Clark 600 horsepower CMA-6, Motor Driven, Balanced/Opposed Compressor which supplies air at 200 psi for test purposes.

Because of the nature of the operation, per-

fect balance and accurate match of supply to demand, through flexible compressor cylinder loading, were important considerations in the selection of a Clark unit. Compactness saved considerable floor area.

A complete Clark line of Balanced/Opposed Compressors in the 150 to 4500 horsepower range is available in various cylinder arrangements to meet practically any requirement. A Clark representative will gladly furnish complete details. Write for Bulletin 118.

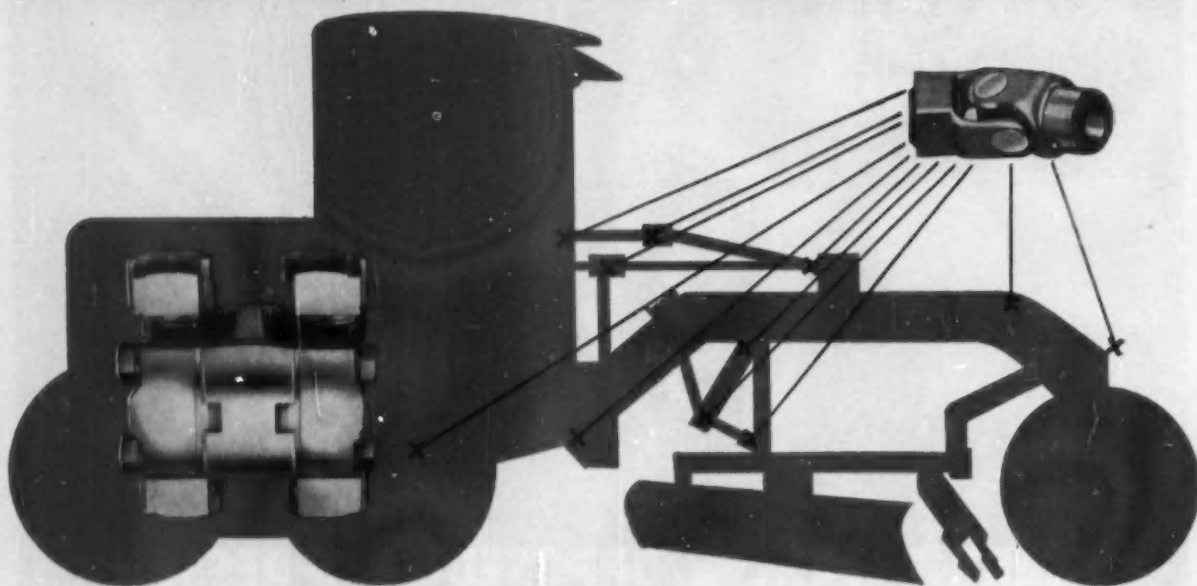
**CLARK BROS. CO. • OLEAN, N. Y.**

ONE OF THE DRESSER INDUSTRIES  
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PRECISION BY THE TON

**CLARK**  
compressors

# RELIABLE



Whether for close-coupled main drive lines or for exposed steering and adjustment drives, designers with JOINT problems have learned to rely on MECHANICS. Where joints must run all day at high angles — where there are severe shock loads — where wide angles and long slip are common — and where dirt and/or moisture constantly are present — MECHANICS Roller

Bearing UNIVERSAL JOINTS are the accepted solution. Lubrication is so tightly sealed in that dirt and moisture cannot enter. If you have a "tough" joint problem, make use of MECHANICS field engineers' wide experience.

**MECHANICS UNIVERSAL JOINT DIVISION**  
Borg-Warner • 2024 Harrison Ave., Rockford, Ill.

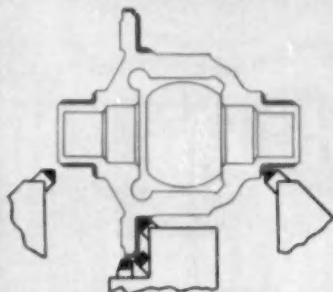
## MECHANICS

*Roller Bearing*

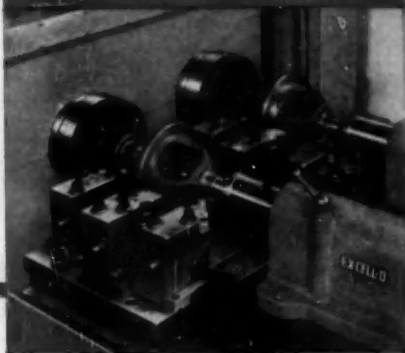
## UNIVERSAL JOINTS

For Cars • Trucks • Tractors • Farm Implements • Road Machinery •  
Aircraft • Tanks • Busses and Industrial Equipment





Heavy lines show the surfaces machined.



Style 112-C Ex-Cell-O Precision Boring Machine with double set-up.

Close-up of the two differential cases, in work position. This precision work is done with hydraulic feeds and easily-controlled automatic cycles.

# Insure your Profits...

with **DOUBLED PRODUCTION** on Ex-Cell-O STANDARD MACHINES



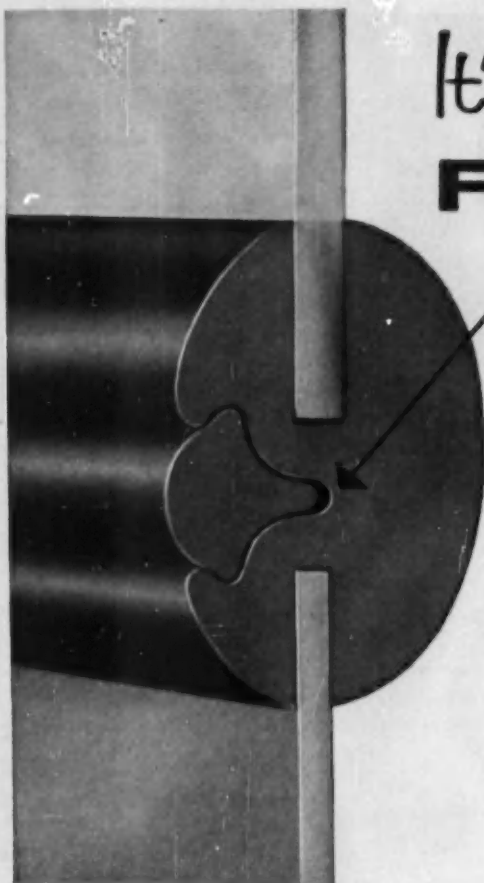
**A NEW APPROACH . . .** Turn four diameters—face three shoulders—chamfer one edge. Not one at a time—but Two! Not on a double end—but on a single end Ex-Cell-O Precision Boring Machine!

Workpieces are automotive differential cases—precision work—limits of plus or minus .0005" on diameters.

See how Precision Boring Machines can save time and money for you. Call your local Ex-Cell-O representative, or phone or write Ex-Cell-O for a Precision Boring Catalog.

**EX-CELL-O**  
CORPORATION  
DETROIT 32, MICHIGAN

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• DRILL JIG BUSHINGS • AIR-  
CRAFT AND MISCELLANEOUS  
PRODUCTION PARTS •  
DAIRY EQUIPMENT



# It's this separate **FILLER STRIP**

**that puts more pressure on  
the fence and the glass...  
making a positive seal!**



**The filler strip makes possible these  
other Inland advantages!**

No cement, clamps, frames or binders are needed to install windows using Inland Self-Sealing Weather Strip. It's an easy, one-man job. The filler strip, which enables the installer to compress the sealing strip *after* the glass is in place, eliminates all the headaches of trying to force *the glass* into a compressed groove. The filler strip, a *patented Inland feature*, makes this the easiest weather strip to install!

**INLAND MANUFACTURING DIVISION**  
General Motors Corporation • Dayton, Ohio



# Self-Sealing **WEATHER STRIP**



**LEAK PROOF!** Permanently leak proof, because it seals both glass and body panel under powerful compression.



**EASY GLASS REPLACEMENT!** Less lost time for vehicles—broken glass can even be replaced on the road, if necessary.



**FREEDOM OF DESIGN!** No provision need be made for moldings, channels, binder strips or cement when designing with Inland Self-Sealing Weather Strip.



**VERSATILITY!** Ideal for vehicles, booths, trains, gasoline pumps, buildings, marine windows—for positive, permanent sealing of any window or panel!



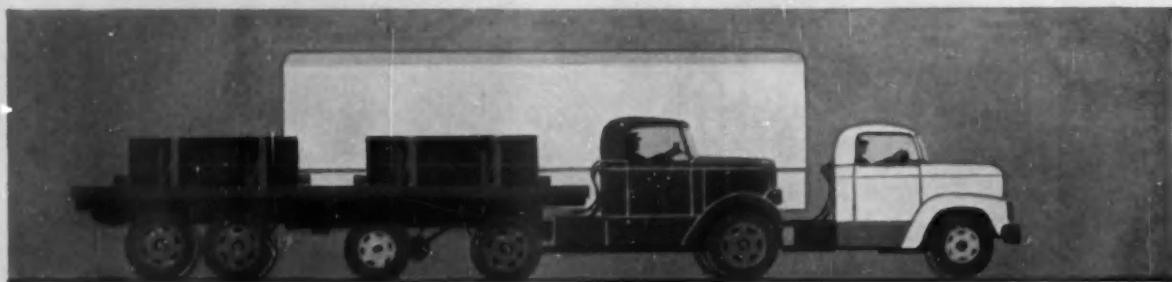
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## AUTOMATIC DRILLING & TAPPING MACHINES

built by Hartford Special provide maximum efficiency and economy. Write for new bulletin illustrating typical single purpose machines custom designed for high production. For the best buy in the long run consult Hartford Special — also maker of Automatic Thread Rollers and Super-Spacer, the world's finest indexing device.

come to

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*Special*



*Engineer* "THE RIDE" with...



FIFTY YEARS' experience in the design and manufacture of leaf springs as original equipment on cars, trucks, buses, and trailers adds up to maximum skill in producing springs which will perform with complete satisfaction under the conditions for which they were designed.

That's why the makers of most of America's trucks use DSP Leaf Springs as original equipment.

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*Also Makers of Tenestru Building Products*  
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SINCE 1904 — ORIGINAL EQUIPMENT ON CARS, TRUCKS, CABS, BUSES, TRAILERS



## TORQUE CAPACITIES

FROM  
**this**



	Maximum Torque Inch Pounds	
	Continuous Load	Hand Operation
K Series		
K2R Series		
K-1-C	350	2,000
K-2-A	350	5,000
L6S Series	400	2,000
L6N Series		

	Recommended Torque Rating, Inch Pounds	
	Needle Bearings	Optional
L10S Series	650	
1FR Series	1,080	
L14S Series	1,230	"
3DR Series	1,800	"
L16S Series	2,200	"
L12N Series	3,300	"
L14N Series	6,000	"
35N Series	10,000	"

N Series	Recommended Torque Rating, Inch Pounds	
	Balanced for	
45N	14,000	3600 R.P.M. Max.
5N	20,000	"
50N	20,000	"
6N	38,000	"
60N	38,000	"
7N	57,000	"
70N	57,000	"
75N	70,000	"

BW Series	Maximum Torque Inch Pounds	
	Continuous Load	Momentary Load
BW-12	1,020	4,450
BW-1	1,695	7,500
BW-2	3,350	11,720
BW-3	4,450	16,800
BW-4	5,080	22,900
BW-5	8,640	34,200
BW-6	11,620	60,000
BW-7	28,600	150,000
BW-9	89,300	500,000

\*Extra shock-load capacity built into all sizes.

you'll get dependable, smooth  
power delivery when you specify

# BLOOD BROTHERS

## Universal Joints

**FOR AGRICULTURAL, AUTOMOTIVE, INDUSTRIAL, MARINE AND CONSTRUCTION EQUIPMENT APPLICATIONS**

Need a moderately small universal joint on your next project—for a hand-operated control rod, for example? Blood Brothers has it! In fact, you can select from any of four Series—all widely used on farm implements, road and construction machinery, tractor steering assemblies, etc.

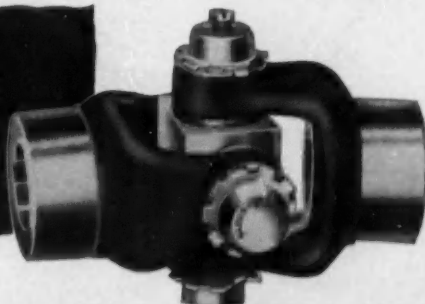
Or do you need a source for high speed joints and propeller shaft assemblies for trucks, busses or other mobile equipment? Blood Brothers builds a wide selection of automotive assemblies with torque capacities to 70,000 inch pounds.

For really heavy work, look at the BW Series—for transmitting up to 1,400 H.P. with momentary loads reaching 500,000 torque inch pounds! It's the largest commercial universal joint made—and Blood Brothers makes it.

Thus, when you specify Blood Brothers, you can select from a wide range of torque capacities... and be confident of top-quality universals that contribute dependability and smoothness to your product's performance.

For details, contact Blood Brothers, stating your specific problem. We'll be glad to cooperate with engineering suggestions.

TO  
**this**



**UNIVERSAL JOINTS  
AND DRIVE LINE ASSEMBLIES**

**BLOOD BROTHERS machine division**

Rockwell Spring and Axle Company  
**ALLEGAN, MICHIGAN**

# Shelby and Sweeney tame a tough nut

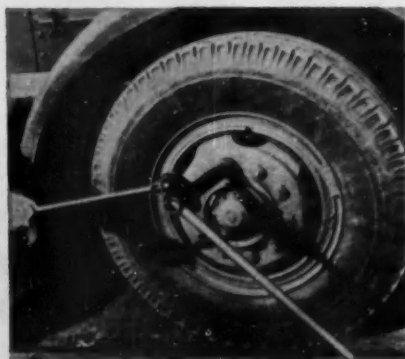
● The Sweeney POWERENCH is a rugged nut turning tool specifically designed with geared action for tightening or loosening the nuts on dual wheels, aircraft propeller shafts, diesel engine cylinder heads, railroad locomotives, and for countless other heavy-duty applications.

Super tough equipment calls for super strong materials. That's why Shelby Seamless Mechanical Tubing—in sizes from 1½ in. O.D. to 5½ in. O.D.—is used in the manufacture of POWERENCH assemblies. The great strength, complete uniformity, and extreme dimensional accuracy of Shelby Seamless make it the ideal mechanical tubing for the fabrication of such heavy-duty materials. Moreover, it is safe and workable—possessing excellent machining and superior welding properties.

Produced to exacting standards by the world's largest manufacturer of tubular steel products, Shelby Seamless Mechanical Tubing is available in a wide range of diameters, wall thicknesses, various shapes and steel analyses. Call on our engineers for recommendations. They will be glad to make a study of your particular requirements and help you apply Shelby Seamless to your specifications.

NATIONAL TUBE DIVISION  
UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.  
(Tubing Specialists)

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS  
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



All Shelby Seamless Tubing is pierced from solid billets of uniform steel. This is the one manufacturing method that assures absolute uniform wall strength.



## USS SHELBY SEAMLESS MECHANICAL TUBING



6-1226

UNITED STATES STEEL

# STROMBERG

## CARBURETORS

*Judge*  
**Carburetor Value as though**  
**you were Buying**  
**rather than Building the Car!**

Put yourself in your customer's shoes. Lasting performance is vital to him—and it's certain to effect the selection of his next car. It is only logical then, to specify components that will insure that characteristic in the engines you build. In carburetors, Stromberg is unique in this respect, for it is a proven fact that Stromberg\* Carburetors last longer. Take the long-range view of carburetor value and you will agree, it's good business to specify Stromberg Carburetors.

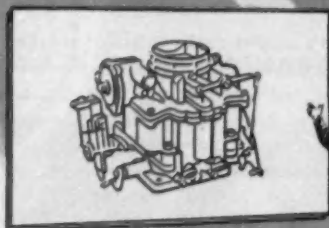
\*REG. U. S. PAT. OFF.

### ECLIPSE MACHINE DIVISION OF


- Standard Equipment Sales: Elmira, N. Y.
- Service Sales: South Bend, Ind.

**Bendix**  
AVIATION CORPORATION

Export Sales: Bendix International Division, 305 East 42nd St., New York 17, N. Y.

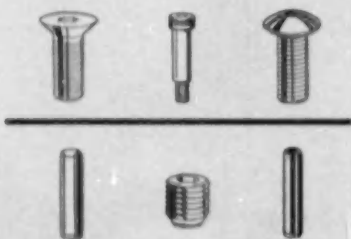
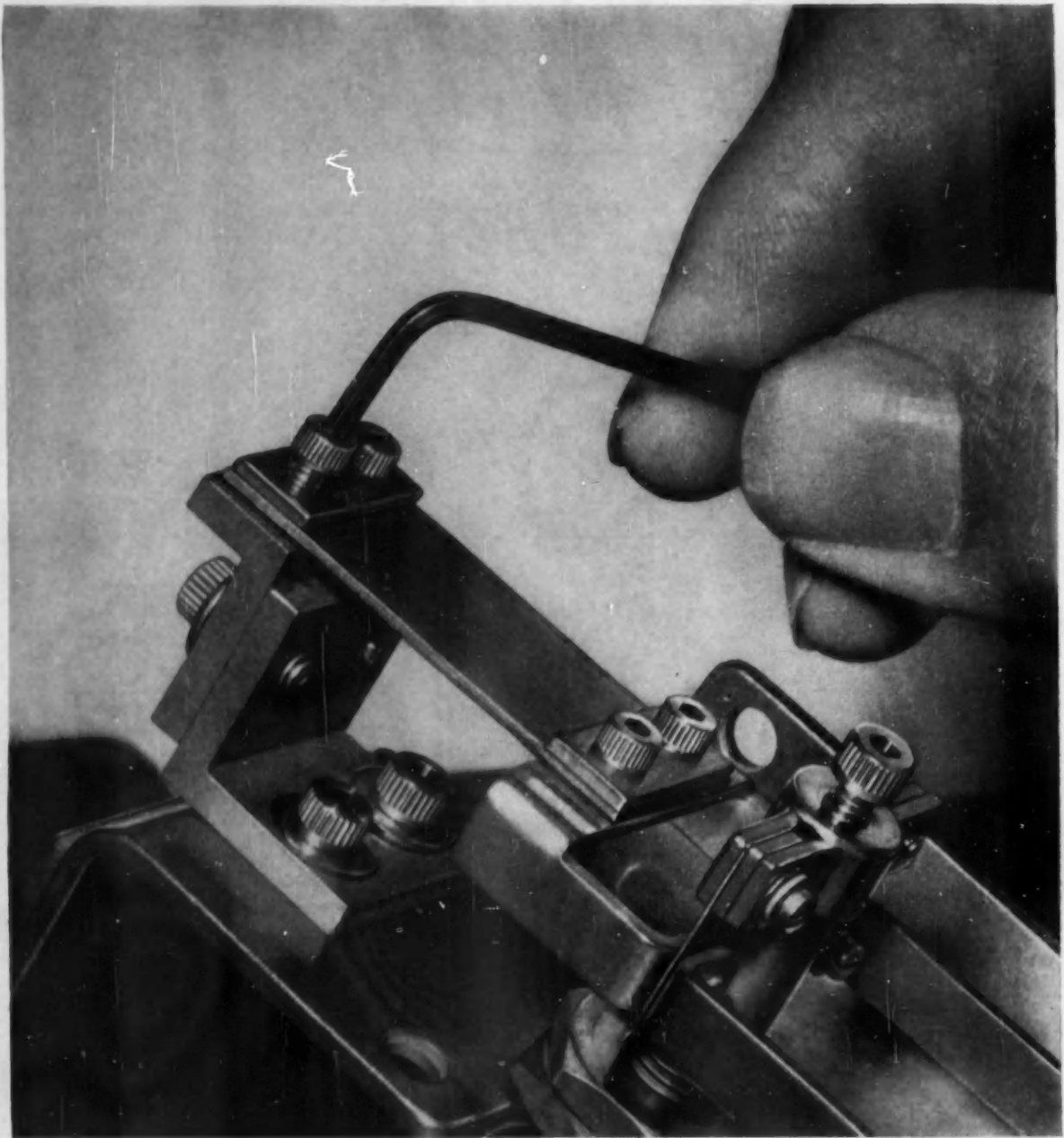


  
 Bendix\* Electric Fuel Pump

  
 Bendix\* Folo-Thru Starter Drive

  
 Stromberg\* Carburetor

## UNBRAKO AT WORK



**MINIATURIZATION.** Small socket cap screws make possible smaller instruments. UNBRAKO Micro Socket Cap Screws range in size from #0 to #3, from  $\frac{1}{8}$ " to  $\frac{1}{2}$ " in length. But they have much more than microsize to recommend them. They are so strong that three UNBRAKOS will do the job of five ordinary cap screws. Or, if you must use the same number of screws, you can safely use smaller UNBRAKOS. All UNBRAKOS have knurled heads for easier handling and faster assembly, and uniform sockets for maximum wrench engagement. Your favorite industrial distributor always stocks UNBRAKOS. STANDARD PRESSED STEEL CO., Jenkintown 53, Pa.



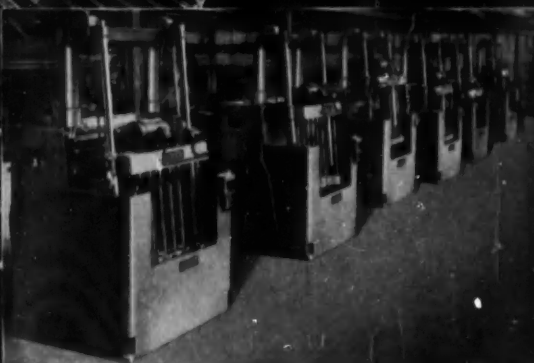
SOCKET SCREW DIVISION



JENKINTOWN, PENNSYLVANIA



# Ten Million TOCCO-Hardened Axle Shafts



Battery of TOCCO machines for hardening automotive axle shafts. TOCCO\*-hardened shafts show an increase of up to 200% in resistance to torsional fatigue over furnace-hardened shafts made of alloy steel.

**Give Super Service to American Motorists**

*... Save Manufacturers \$2,000,000*

The application of TOCCO\* Induction Heating to the surface hardening of rear axle drive shafts for passenger cars and trucks provides a fine example of how a less expensive manufacturing method often results in the best possible end product.

For instance, TOCCO\* Induction Hardening permits the substitution of easier machining carbon steels for expensive alloys, saving from 25¢ to 55¢ per car in material costs alone. Additional savings result from the fact that TOCCO eliminates the

need for annealing, tempering and shot peening operations formerly required. Moreover, long hauls to and from the heat-treating department are eliminated because cool, clean TOCCO\* fits right in the production line—next to related operations.

If you make parts that require hardening, annealing, brazing, or heating for forging or forming, it can pay you handsome dividends to investigate TOCCO\* Induction Heating as a sound method of improving product quality *while reducing costs.*

**THE OHIO CRANKSHAFT COMPANY**



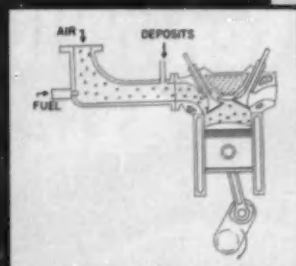
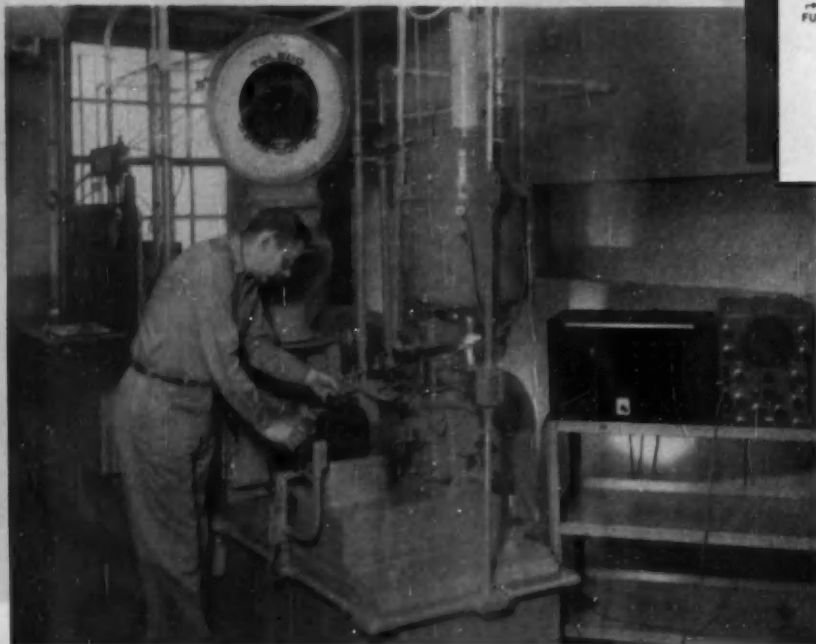
# TOCCO

**NEW FREE BULLETIN**

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THE OHIO CRANKSHAFT CO.  
Dept. H-3, Cleveland 1, Ohio  
Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating."

Name \_\_\_\_\_  
Position \_\_\_\_\_  
Company \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_



A Schematic diagram of unusual "Dust-Injection" engine. Engine operates under typical non-knocking conditions to isolate chemical reactions associated with surface ignition.

A modified C. O. T. Engine and an Electronic Counter are the apparatus used in the "aspirated deposit surface ignition test" at the Du Pont Petroleum Laboratory. Engineers create controlled surface ignition by introducing a small quantity, usually 0.1 g or 0.5 g, of powdered combustion-chamber deposit into the intake port.

## Unique *Dust-Injection* engine for studying surface ignition at the Du Pont Petroleum Laboratory

By increasing the compression ratio of an engine you increase the engine's fuel utilization efficiency. However, with present fuels you're faced with the engine's increased tendency toward surface ignition.

For many years, Du Pont has been pioneering the study of engine deposits and their contribution to knock and surface ignition.

### Pin-pointing ping

In order to study the erratic process of surface ignition under controlled conditions, engineers at the Du Pont Petroleum Laboratory developed a novel test, called the "aspirated deposit surface ignition test." The technique uses a single-cylinder engine, modified to permit the introduction into the intake port of a small amount of powdered combustion-chamber deposit.

The dust-injection engine uses a fuel susceptible to surface ignition, containing benzene or diisobutylene. The number of surface ignitions caused by the introduction of the combustion-chamber "dust" is taken as the measure of surface ignition harm of deposits.

An internal type of pickup, mounted in the engine cylinder, detects surface ignition. The number of surface ignitions is counted by a four-decade counting unit actuated by a signal from the pickup.

### Progress Report

The "dust injection" test is one of many projects comprising Du Pont's fundamental approach to assist the automotive industry in overcoming surface ignition.

Findings from this unique test method reveal the relationship between the com-

position of combustion-chamber deposits and their contribution to surface ignition. This knowledge suggests leads to new additives with the ability to overcome the harmful action of these residues.

A technical paper, "Pre-Ignition in Automotive Engines," discusses in detail the Du Pont work on this problem. Write us if you would like to have a copy.



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## High Spots of This Issue

### ★ Continental's New V-8 Engines for Many Applications

After many months of design, development, and testing work, Continental Motors Corp. has come forth with a new group of compact V-8 engines for use in various fields. Their advanced features are described in this article. See Page 48.

### ★ Automation News Report

Introduced in this issue is a new department to appear in each first-of-the-month number. Featuring special news of the automatic control industry, it complements traditional AI coverage of automation developments. Page 51.

### ★ Engineering Features of 1955 Packards and Clippers

New V-8 engines, Twin-Ultramatic transmission, torsion bar suspension system on some models, and eye-catching styling characterize Packard's car line for 1955. All of these major changes are minutely detailed by the author. Page 54.

### ★ Various Types of Automation at Pontiac Engine Plant

In setting up the lines for production of its new V-8 engine, Pontiac really "shot the works" from an automation point of view. For example, power-and-free conveyors are widely used to integrate various operations. See Page 60.

### ★ General Purpose Tools Efficient for Cylinder Blocks

Schramm, Inc., well-known maker of Pneumattractors and air compressors, must reconcile a need for high variety with comparatively low production. How it uses general purpose tools to meet this requirement is related here. Page 64.

### ★ 35 New Product Items And Other High Spots, Such As:

Economic factors in 1955 automotive picture; 1954 as fourth highest year; new features of 1955 Nash; aircraft industry activities for 1955; Hudson offers wide choice of power plants; ASME meeting; aircooled automotive Diesels; and jet plane parts on 2100-ft paint line conveyor.

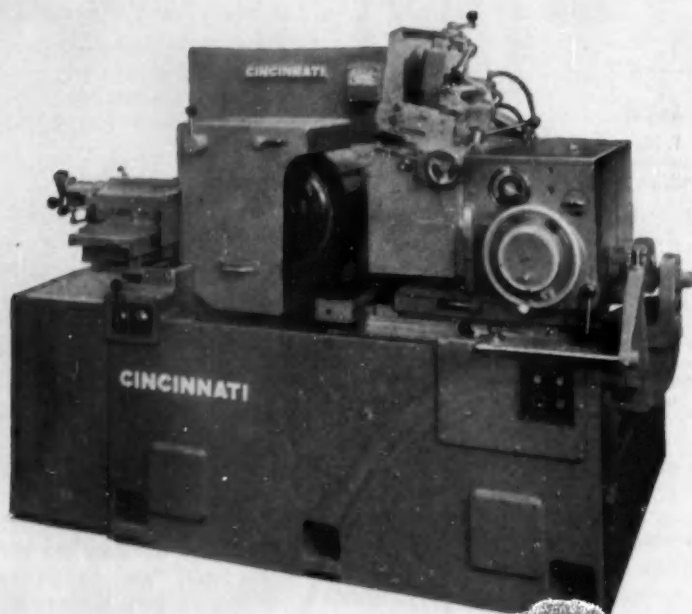
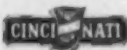
**Automotive and Aviation News, Page 33**  
**Complete Table of Contents, Page 3**

# The Hottest News in Centerless Grinding in 30 Years

## ...the New Cincinnati Filmatic No. 2



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# News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 112, No. 1

January 1, 1955

## Big Modernization Plan In Wind for Studebaker

Specific details about a modernization program at Studebaker, similar to the one just completed at Packard, are expected to be announced soon. It is not known yet whether the plan will include construction of new plants in South Bend, Ind., or revamping of existing facilities.

James J. Nance, president of Studebaker-Packard Corp., has stressed the possibility of diversification into a non-automotive field, possibly electronics, and said a strong bid would be made to get into a guided missile program at South Bend. The proposed plans lend further weight to S-P's aim to continue operating Studebaker as a separate entity in South Bend.

## Motor Products Employees Buck General Tire Bid for Control

Latest information on General Tire & Rubber Co.'s efforts to win control of Motor Products Corp., Detroit automobile parts and appliance concern, indicates a final decision by Motor Products stockholders may be expected shortly.

General has been seeking to acquire a majority stock interest in Motor Products since last August. It has, however, run into difficulties with Motor Products employees, who have entered into a stock-buying war to prevent the Akron, O., company from taking over Motor Products.

In what is believed to be the largest undertaking of its kind in the country, Motor Products workers, hoping to influence other small stockholders to retain their holdings, started a mass movement to purchase stock themselves under a monthly installment plan. This was done despite reassurances from General Tire officials that the company would continue to operate in Detroit.



## JEEP ENLARGED AND STREAMLINED

The redesigned Model CJ-5 Jeep for 1955 is larger overall than its predecessors with a length of 131 $\frac{3}{4}$  in., width of 59 $\frac{1}{8}$  in., wheelbase of 81 in., and four more square feet of carrying capacity. The four-wheel drive vehicle, which has a streamlined hood, contoured fenders, and a large windshield, is powered by the Willys F-head Hurricane 75-hp engine. Other new features include: all-weather top; back-lighted instrument cluster; passenger-car type handbrake; and variety of new colors.

## Additional Expansions Cost Chevrolet \$10 Million More

Expansions beyond the limits originally scheduled for the Chevrolet Buffalo area have totaled more than \$10 million. The program, launched early in 1954 and being extended into 1955, has centered around the new forge and foundry in Tonawanda, N. Y. A total of \$55 million was spent on those facilities last year.

The additional \$10 million is for production tooling and plant investment. The expenditure is expected to result in a 12 to 14 per cent increase in Chevrolet production capacity in the Buffalo area this year.

## Brockway Sale to H & B Is Not to be Completed

Brockway Motor Co. has announced that sale of the company to the H & B American Machine Co., Inc., has been

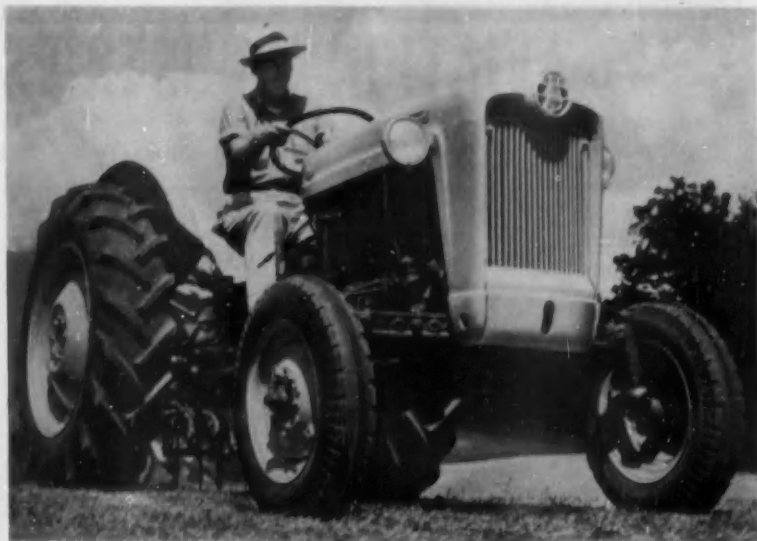
cancelled. According to reports, H & B was unable to arrange financing to complete the deal.

It had been contemplated under the sale that Brockway's operations would be continued with H & B taking control of the business and assets. Now, however, Brockway will continue in business as before the decision to sell.

## 19 Ousted Workers Lose Suit Against Studebaker

A complaint by 19 former Studebaker workers against the corporation and union local charging unfair labor practices has been dismissed by the National Labor Relations Board. Filed about a year ago, the suit alleged that the workers were suspended from their jobs because they drove cars other than Studebakers. The board held that neither the union nor the corporation had such a policy.

# News of the AUTOMOTIVE



## FORD OFFERS TWO TRACTOR SERIES FOR 1955

The powerful 860, newest model in the Ford tractor line for 1955, is designed for live power take-off work. Five-speed transmission and 172 cu in. Red Tiger engine are installed in both the 860 and 850, the latter a second model in the 800 series. Another power series, the 600 with three models, is also available to mark the first time that the company has offered more than a single size tractor.



## QUICK-THINKING ELECTRONIC BRAIN

Depicted here is the new Naval Ordnance Research Calculator, built for the Navy by International Business Machines Corp., which is expected to speed the solution of vital defense problems that often require billions of computations. In the foreground is one of the two printers used in the installation, each of which can print at a rate of 18,000 characters a minute without interrupting calculation. In the background is the logical and arithmetical section of the computer.

## Chrysler Corp. Reports Orders Are Nearing Half Million Mark

The favorable reception that the 1955 line of Chrysler cars has had is pointed up in a report which shows that orders from dealers totaled 448,000 as of Dec. 13—about a month after the new models were introduced to the public. Included in the total were 248,000 Plymouths, 100,000 Dodges, 40,000 DeSotos, and 60,000 Chryslers and Imperials.

It is difficult to make any comparisons with orders during the same period of 1953 because the various Chrysler divisions introduced the 1954 cars at staggered periods between Oct. 7 and Nov. 10. All the divisions showed their 1955 cars simultaneously on Nov. 17, 1954.

In comparing employment figures, Chrysler Corp. notes that a rapid production rate has boosted these to 160,000 persons throughout its plants in the U. S. during December, against 130,000 in the same period in 1953. For the week ended Dec. 1, an average of more than 1000 persons per working day was added to employment rolls.

While a breakdown of General Motors sales figures was not available, the corporation reported that its retail passenger cars sales during the first ten days of December established a record for that period. Sales of all GM divisions in that period reportedly were double over those for the same ten days of 1953 to exceed production by a substantial margin.

## GM Approves \$9 Million More for Expansion Plans Abroad

Approval of an additional \$9 million for plant expansions in Europe brings the total outlay by General Motors Corp. for overseas plants to \$191 million under its current program abroad. Included in the latest expenditures are GM plants in France, Sweden, Denmark, and England.

Biggest expenditures will go for expanding manufacturing facilities of GM's AC-Delco Divs. in France and England, which manufacture spark plugs, fuel pumps, air cleaners, and other accessories. In France, GM will consolidate the Frigidaire Div. with AC-Delco.

# AND AVIATION INDUSTRIES

## New Chassis Parts Plant To Be Erected By Ford

Construction of a new plant this year for the manufacture of chassis parts just north of Detroit will mark one of the last phases of a \$1.6 billion program started by Ford Motor Co. at the end of WW II. When the program is completed, the company will have added more than 39 million sq ft of floor space to its facilities throughout the country.

Specific details about the new plant, to be located on a 137-acre tract of land in Sterling Township several miles north of Ford's present parts plant, are expected to be announced soon.

Since the end of the war, Ford has either constructed or acquired 26 new manufacturing and assembly plants, 19 parts depots, and 13 major engineering, research, and office buildings. It has modernized and enlarged 22 other plants and facilities.

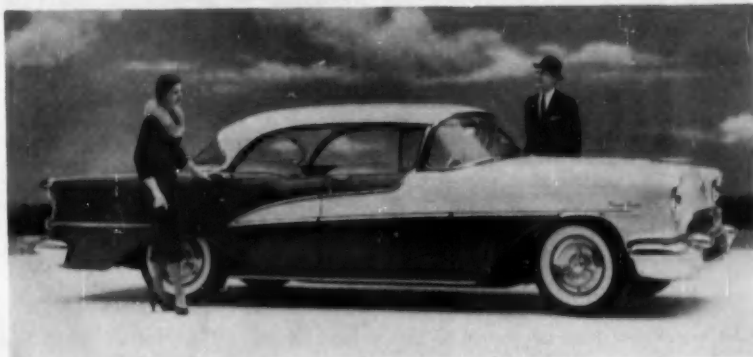
A major portion of the expansion program has already been completed. The program which extends into 1955 includes construction of assembly plants in Mahwah, N. J.; San Jose, Calif., and Louisville, Ky. These are in addition to an assembly plant in Dearborn for the new Continental Div. and a new general office building.

The company's engineering facilities also have expanded rapidly under the program. Among them are six new buildings in the 750-acre Research and Engineering Center in Dearborn and a 4000-acre site north of Detroit where Ford will build its biggest proving ground.

## GM Motorama Scheduled To Appear In Five Cities

The General Motors Motorama will again appear in five major cities in 1955. This year, however, the show will bypass Chicago and will instead be taken to Boston for the first time.

The show will open at the traditional Waldorf-Astoria Hotel site in New York City and run from Jan. 20-25. It will then go to the Dinner Key Auditorium in Miami, Fla., Feb. 5-13; Pan Pacific Auditorium, Los Angeles, Calif., March 5-13; Civic Auditorium, San Francisco, Calif., March 26-April 3; and then on to Commonwealth Armory, Boston, Mass.



## BUICK AND OLDSMOBILE PRESENT FOUR-DOOR HARDTOPS

On display for the first time at the Chicago Automobile Show are the four-door hard-top Buick Riviera (top) and Oldsmobile Holiday (bottom) sedans. The former will be offered in both the Century and Special Series, while the latter will be available in all three 98, Super 88, and 88 Series. Production of the two models is expected to begin shortly. Prices of the cars have not been announced as yet.

## WHITE MOVES UP INTO SIXTH PLACE IN 10 MONTHS SALES

### 1954 New Truck Registrations\*

Arranged by Makes in Descending Order According to the 1954 Ten Months' Totals

TEN MONTHS							
MAKE	October	September	October	Units		Per Cent of Total	
	1954	1954	1953	1954	1953	1954	1953
Chevrolet	24,722	24,403	29,441	247,096	284,174	35.40	36.02
Ford	21,843	21,890	27,616	226,170	213,881	32.66	27.82
International	8,796	8,237	7,407	70,194	82,861	10.06	16.47
G. M. C.	8,315	8,111	8,413	66,550	71,925	8.10	9.11
Dodge	5,168	4,988	5,254	50,060	70,854	7.17	8.96
White	1,045	634	1,007	8,727	10,480	1.25	1.33
Studebaker	634	632	1,586	8,384	20,296	1.20	2.67
Willis Truck	1,411	1,017	636	7,216	7,290	1.03	.92
Willis Jeep	664	667	704	6,182	7,705	.89	.98
Mack	462	509	661	5,063	5,967	.73	.76
Diamond T	206	200	309	2,214	2,925	.32	.37
Reo	217	192	294	1,950	2,025	.28	.30
Brookway	141	138	186	1,110	1,738	.16	.22
Autocar	98	46	201	822	1,513	.13	.19
Misc. Domestic	531	292	550	3,940	5,106	.54	.65
Foreign	95	25	35	297	241	.04	.03
Total—All Makes	71,254	66,174	82,661	699,093	799,231	100.00	100.00

\* Based on data from R. L. Polk & Co.

# News of the AUTOMOTIVE



## WILLYS LINE IS RESTYLED FOR 1955

The Custom four-door sedan shown here, one of two Willys cars being offered for 1955, replaces the former Ace. Other Willys model is the Bermuda two-door hardtop sedan in place of last year's Eagle. Both cars have been restyled with a new full-width grille, bumpers and bumper guards, tail lights, headlamp visors, etc., and are powered by the Willys 115-hp Super Hurricane engine. Tubeless tires are standard equipment, and mechanical improvements include new worm and roller steering system with a 22.4 to 1 overall ratio and new hydraulic brake fluid filler. The Willys station wagon, Kaiser Manhattan, and Kaiser Darrin sports car remain basically unchanged.

## Kaiser-Willys to Emphasize Commercial Vehicles

Kaiser-Willys may yet prove to be the big surprise of the year in the automobile industry. The company has been having its difficulties and made a rather poor showing in 1954. Production was down nearly 75 per cent from the preceding year, and, for a period of nearly six months, the company produced no cars at all.

During the period of automotive inactivity, however, the company was busily streamlining its operations and sloughing off surplus plants and equipment, a job now largely completed. All production will be centered at Toledo, O. for enormous savings in overhead.

In addition, Kaiser-Willys has reached an understanding with its labor force which has greatly increased efficiency. It now is producing 20 per cent more with 42 per cent fewer employees.

While these steps certainly put Kaiser-Willys in a much better position to compete, the most significant decision is the one to concentrate primarily on commercial vehicles, particularly in the specialized four-

wheel-drive class, rather than on passenger cars. The Willys line has been cut to two models, and the Kaiser Manhattan and Darrin will be available in limited numbers. The previous line included 10 models.

The implications of this move to switch the emphasis to commercial vehicles are important. It could be construed to mean that the Kaiser car soon will fade from the scene and that the Willys models will be used primarily to give the dealers something to sell if they want to be in the passenger car business.

Prices have been reduced drastically on the Willys—\$300 on one model and \$400 on the other—to bring them below the Big Three comparable models and even slightly below the Nash Rambler. In order to accomplish these price cuts, Willys must have gotten its production costs well in hand.

Further indication of the upturn in Kaiser-Willys fortunes is the fact that the company made a profit in October on a volume of about 9000 vehicles, practically all of them in the

commercial line. Company officials report that the break-even point is below the 9000 figure.

Another very important factor is that Willys now is the third largest exporter of automotive vehicles, exceeded only by General Motors and Ford. It would thus seem that the company has made a wise choice in concentrating on its commercial line.

## SAE Golden Anniversary Event To Survey Future from Present

Motor vehicles, aircraft, engines, and manufacturing equipment and methods of the year 2005 will be visualized at the SAE Golden Anniversary Meeting this month. The event, scheduled for Jan. 10 to 14 at the Sheraton-Cadillac and Statler Hotels, Detroit, Mich., is the first of 11 Golden Anniversary Meetings scheduled for 1955 by SAE.

This annual meeting will present panoramic glimpses of the world's automotive future as seen through the eyes of the present. Technical sessions will feature speakers extrapolating the present in terms of future aircraft engineering; fuels and lubricants; aircraft powerplant development; tractors and farm implements; automobile bodies; transportation and maintenance; styling; body engineering; engineering materials; motor trucks and buses, etc.

At the annual banquet, to be held Jan. 12 in the Detroit Masonic Temple, the first plaque honoring SAE Pioneer members will be presented to P. M. Heldt. Retired engineering editor of *Horseless Age* and AUTOMOTIVE INDUSTRIES, it was Mr. Heldt's editorial in the June 4, 1902, issue of the former publication which stimulated the formation of SAE.

The program also includes a round-table discussion on cost reduction in automotive manufacturing, a symposium on air pollution, studies of the various aspects of automation, and consideration of the use of plastics for truck bodies. Also featured are new techniques of vehicle suspension, development of turbine powerplants, 1955 automobile engines, and the development and testing of automotive materials. An engineering display will be held during the meeting.



# AND AVIATION INDUSTRIES



## SEED-BLASTING JETS

*Shown in operation at the General Electric Co. jet engine plant at Evendale, O., is a powerful seed-blast gun. The operator uses a combination of rice hulls and ground walnut shells to blast off surface dirt from J47 jet engines. The walnut shells furnish the cleaning element while the rice hulls provide a polishing action.*

## Motor Wheel Enters Lawn Mower Business

Announcement by Motor Wheel Corp. that it is entering the lawn mower field further illustrates the emphasis being placed on product diversification by automotive suppliers. Motor Wheel, which recently purchased the lawn mower business of Reo Motors, Inc., will manufacture a complete line of rotary and reel power lawn mowers at its Duo-Therm Div. in Lansing, Mich., and market them under the name of Duo-Trim. In addition, Motor Wheel plans to continue manufacturing Reo lawn mowers, thus giving it two separate lines.

Motor Wheel purchased all the physical assets of Reo's lawn mower business from the latter, including the tools, dies, jigs, fixtures, machinery, trademarks, and allied equipment.

## Pesco Products Opens Detroit Sales Office

Pesco Products Division of Borg-Warner Corp. has opened a Detroit sales office for its industrial products. Located in the Penobscot Bldg., the office will be headed by Harry J. Scott and F. Harry Bourke.

# AI TABLOID

Trans-Main Corp. has purchased the torque converter parts inventory of the Motor Coach Div. of General American Transportation Co. . . . The assets and business of Globe Steel Tubes Co. have been purchased by Babcock & Wilcox Co. . . . Silver Line Brake Lining Corp. has purchased the U. S. Spring & Bumper Co. Brake Div.

\* \* \*

Curtiss-Wright Corp. has developed what is claimed to be the first rocket engine in the U. S. that can be throttled up and down at will. No details are available.

\* \* \*

Products of the new Nuclear Div. of Martin Aircraft Co. are to be atomic power reactors and related equipment for industrial, commercial and military use.

\* \* \*

Bendix Aviation Corp. has changed the name of its Eclipse-Pioneer Foundries Div. to Bendix Foundries. . . . Twin Coach Co. plans a change in its corporate name to Twin Coach & Aircraft Co. . . . Ace Tool & Die Co. is now known as Ace Tool & Machine Co.

\* \* \*

Tests are underway at Lockheed Aircraft Corp. on more than 24 different ways to slow down fast-landing jet aircraft.

\* \* \*

Kaiser Metal Products, Inc., has been awarded a contract by a leading aircraft company for a number of stainless steel jet engine components. . . . Temco Aircraft Corp. has received a contract extending its production of Lockheed P2V Neptune wings well into 1956.

\* \* \*

General Electric Co. and Fairchild Engine & Airplane Corp. have both been awarded Air Force contracts for development of a new small turbojet engine to be used in drone and pilotless aircraft.

Purolator Products, Inc., has opened a new plant at Allentown, Pa., for production of bulk oil filters. . . . Wesson Metal Corp. has completed its new plant at Lexington, Ky. . . . Bakelite Co. has opened new plant facilities at Bound Brook, N. J., for output of polystyrene and development of styrene molding.

\* \* \*

Caterpillar Tractor Co. is setting up a new subsidiary in Brazil to manufacture and sell certain earth-moving equipment and parts.

\* \* \*

Ford Motor Co. will locate a new parts depot in Minneapolis, Minn. . . . Barnes Drill Co. has opened a new sales office at 3419 S. Telegraph Rd., Dearborn, Mich.

\* \* \*

White Motor Co. of Canada, Ltd., is constructing a new sales and service branch in Montreal. . . . International Harvester Co. of Canada, Ltd., is building an addition to its truck manufacturing plant at Chatham, Ont.

\* \* \*

North American Aviation, Inc., is erecting a \$5 million wind tunnel at El Segundo, Calif. . . . Boeing Airplane Co. is now rebuilding its own machine tools at its Seattle Div. . . . Northrop Aircraft, Inc., has installed a TelAutograph system at its Hawthorne, Calif., plant.

\* \* \*

Willys Motors, Inc., has submitted a plan to the Government of India for the manufacture of a Jeep-type vehicle in that country.

\* \* \*

Du Pont Co. has cut the price of its pure silicon \$50 a pound.

\* \* \*

A. V. Roe Canada, Ltd., is said to be developing a new jet engine that reportedly will have a thrust of between 20,000 and 25,000 lb.

(Turn to page 102, please)

# News of the AUTOMOTIVE



## DIESEL DONATES

In recent ceremonies at the Franklin Institute of Philadelphia, Dr. Eugene Diesel (second from left), son of the famed inventor, donates to the organization an original document prepared by his father. The manuscript in Rudolf Diesel's handwriting outlines his early ideas on the application of the Diesel engine to railroad locomotives.

## Gould-National Takes Over Three Solar Battery Plants

Acquisition of certain facilities of Solar Corp. by Gould-National Batteries, Inc., will enable the latter to expand its battery production. Gould-National purchased three Solar battery manufacturing plants in Milwaukee, Los Angeles, and Ogden, Utah.

## New Plastics Applications Told at SPI Conference

H. V. Beckerleg, Laboratory Director, Fisher Body Div., General Motors Corp., told approximately 500 registrants at the Fifth Annual Plastics Film Sheeting and Coated Fabrics Conference, sponsored by the Society of the Plastics Industry in New York City last month, that the latest use of vinyl for passenger cars is in convertible tops. This new top consists of two cotton sheets with a rubber innerlining and an exterior of vinyl.

Another new application is the combination of a foam vinyl and a plastisol type surface which will be cured simultaneously for arm rest pads and instrument panel crash pads. It was pointed out by Mr. Beckerleg that vinyls used for passenger cars must be serviceable within a temperature range from -20 F to 200 F.

Since the vinyl must be supported for automotive applications, Fisher Body uses a variety of backing materials depending on the end use of the vinyl laminate. One of the drawbacks noted by Mr. Beckerleg is the lack of color match in shipments of vinyl sheeting.

Speaking on saran, Grant W.

Cheney, Dow Chemical Co., stated that with more colorful car upholstery the seat cover market for new cars has decreased very rapidly to something like 20 per cent of the previous maximum. Saran is currently being used as standard equipment body cloth for both the Ford ranch wagon and Ford truck.

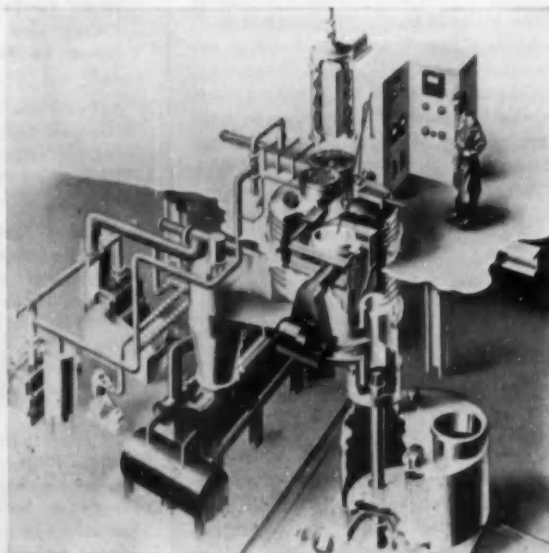
It was stated by Vernon Pierce, vice-president, Kaykore Industries, that the automotive trade obtains approximately 50 per cent of its supported vinyl material from the laminating of cloth to vinyl at the calendar. The procedure in this method is to anchor-coat the cloth and then preheat it just before the cloth enters between the middle and bottom roll of the calendar, which also carries the thermo-softened film of vinyl.

Another sound application for vinyl plastics was pointed out by Eli A. Haddad, Monsanto Chemical Co. This product is a highly elastomeric uncoated vinyl used as a harness tape for the wrapping of automotive electrical wires.

It was also pointed out at the conference that in six years, from 1948-1953, vinyl sales have increased 300 per cent. The industry is currently using 310 million pounds annually, and this figure is expected to rise to 500 million pounds in the near future.

## MELT FURNACE

This is an artist's conception of a 1000-lb. vacuum-melting furnace to be installed at the Detroit pilot plant of General Electric's Carboloy Dept. early this year. The unit, which operates semi-continuously, is being built by Consolidated Vacuum Corp. Control panel for vacuum melting and charging unit are located on mezzanine floor. Melting tank, center, three-stage vacuum pump, foreground center, discharge tank, lower right, with ingot mold in pouring position directly above it, complete important furnace elements.



# AND AVIATION INDUSTRIES

## Bohn Expects to Keep Reo Active in Truck Business

Bohn Aluminum & Brass Corp., which recently purchased Reo Motors, Inc., has indicated that it definitely plans to keep the latter in the truck business. All of Reo's plant space in Lansing, Mich., including area formerly occupied by Reo's Lawn Mower Div., which has been sold to Motor Wheel Corp., will be used for truck production under a new program set up by Bohn Aluminum. It was also disclosed that Reo has sold its Pal Products Div. to Pal Products, Inc., a new company, for an undisclosed sum.

In a reorganization of management at Reo following purchase of the company by Bohn, John C. Tooker was elected president to succeed Joseph S. Sherer, Jr.

## AMC Shows \$11 Million Loss For Fiscal Year

Costs for new car model changeovers and the movement of production facilities are expected to result in another loss for American Motors Corp. in the quarter ended Dec. 31. In the first annual report issued by AMC since Nash and Hudson consolidated last May 1, the corporation reported a net loss of \$11.071 million for the fiscal year ended Sept. 30.

The merger is being accomplished in less time and cost than originally anticipated. Both of the merged companies are already in combined production about six months ahead of schedule.

AMC so far has used only \$9.156 million of an \$11 million reserve provided at the time of the merger to cover costs of obsolete tools, inventories, and commitments resulting from integration of product lines. The balance has been returned to earned surplus. Both the loss from operations and charges to the merger reserve were cushioned approximately 50 per cent by recovery of Federal income taxes which Nash-Kelvinator paid in previous years.

According to the annual report, current assets of AMC and its subsidiaries totaled \$169.841 million, and current liabilities amounted to \$87.756 million at the close of the fiscal year. The difference representing net work-

# FORD EDGES OUT CHEVROLET SLIGHTLY IN 10 MONTHS

## 1954 New Passenger Car Registrations\*

Arranged by Makes in Descending Order According to the 1954 Ten Months' Totals

MAKE	TEN MONTHS						
	October		October		Per Cent of Total		
	1954	1953	1954	1953	1954	1953	
Ford	113,072	107,849	118,996	1,144,770	906,967	28.29	18.60
Chevrolet	91,140	106,816	125,047	1,122,030	1,162,700	34.78	23.68
Buick	42,357	41,657	38,370	435,974	392,440	9.63	8.08
Oldsmobile	36,982	34,130	18,030	343,930	296,041	7.89	5.48
Plymouth	16,648	19,136	83,430	316,963	305,955	7.00	10.38
Pontiac	16,630	24,544	28,852	279,814	322,253	6.16	9.62
Mercury	16,465	17,690	33,906	236,563	236,776	6.28	4.73
Dodge	11,116	10,483	22,658	123,600	251,059	2.73	5.16
Cadillac	8,129	8,237	4,670	81,017	62,398	2.01	1.69
Chrysler	8,773	8,753	11,318	81,164	130,748	1.79	2.88
Studebaker	6,467	6,298	14,267	77,061	140,629	1.70	2.86
Nash	6,719	6,798	7,292	71,634	123,479	1.86	2.83
De Soto	5,276	5,100	10,292	62,883	163,732	1.38	2.13
Packard	2,922	3,173	4,170	34,435	64,747	.76	1.33
Lincoln	2,608	3,070	2,380	31,386	35,206	.68	.72
Hudson	2,672	2,685	4,914	29,748	68,353	.66	1.20
Willis	1,294	1,193	2,419	18,585	38,367	.34	.79
Kaiser	898	714	1,007	8,038	21,323	.18	.44
Henry J.	75	105	435	1,119	10,161	.02	.21
Misc. Domestic	67	256	66	1,627	2,640	.04	.04
Foreign	2,324	2,685	2,239	20,408	25,476	.45	.82
Total—All Makes	395,943	407,944	504,697	4,526,624	4,874,741	100.00	100.00

\* Based on data from R. L. Polk & Co.

ing capital was \$82.084 million, and cash on hand amounted to \$45.402 million.

AMC's bank loan stood at \$29.2 million compared with \$69.6 million at the time of the Nash-Hudson merger. A total of \$43.8 million is thus left as the unused portion of the corporation's bank credit.

As automobile production is now

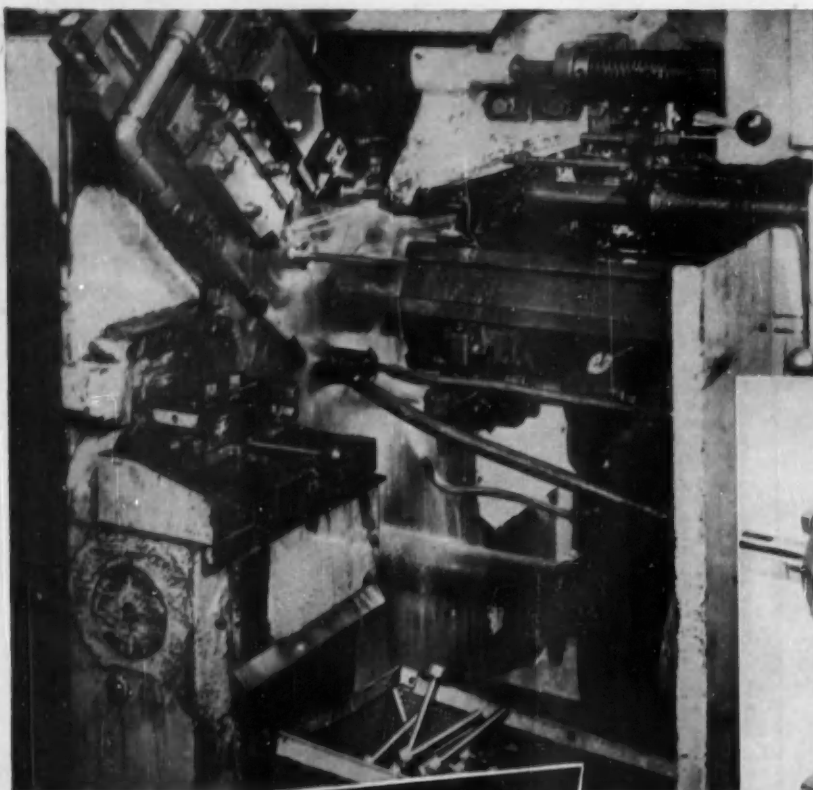
rising rapidly, AMC believes "such operations will be shortly at a highly efficient level." Despite three increases in production schedules on the Rambler car, these are sold out beyond January.

Continued on Page 100

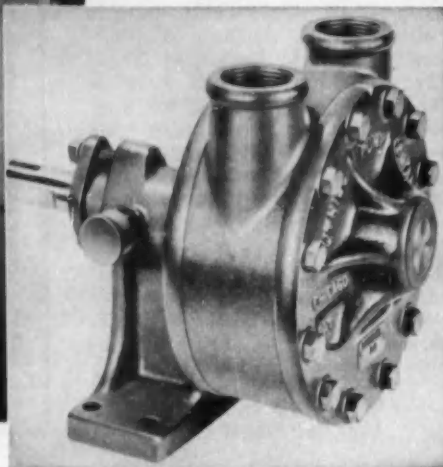
## 1954 RETAIL CAR SALES BY PRICE GROUPS\*

Price Group	October		Ten Months	
	1954		1953	
	Units†	% of Total	Units†	% of Total
Under \$2,000	233,003	59.22	310,193	61.75
\$2,001 to \$2,900	105,725	26.87	137,179	27.31
\$2,901 to \$3,500	40,030	10.17	41,485	8.26
Over \$3,500	14,790	3.74	13,467	2.68
Total	393,548	100.00	502,324	100.00
Price Group	October		Ten Months	
	1954		1953	
	Dollars	% of Total	Dollars	% of Total
Under \$2,000	\$438,429,541	51.61	\$584,895,216	54.07
\$2,001 to \$2,900	245,029,704	29.85	307,291,896	29.89
\$2,901 to \$3,500	109,182,862	12.85	114,040,828	11.12
Over \$3,500	56,790,664	6.69	49,864,271	4.86
Total	\$849,432,771	100.00	\$1,055,032,211	100.00

\*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.  
†—New registrations of American made cars only. Does not include imported foreign cars.



**AUTOMATIC** screw machine producing parts for Tuthill industrial pumps, like the typical Model M shown below. Dual-purpose *Texaco Cleartex Oil B* has been used successfully for seven years as cutting oil and machine lubricant.



# SEVEN YEARS OF SAVINGS

## TUTHILL PUMP COMPANY

Chicago, started using *Texaco Cleartex Oil B* seven years ago. And they're glad they did. Says E. M. Voelker, Superintendent:

"*Texaco Cleartex Oil* got us out of our cutting oil troubles, and has kept us out. And though materials and operations may change, we know we can count on

**Texaco Lubrication Engineers** to help us keep up the savings we've been enjoying for the past seven years."

By switching to *Texaco Cleartex Oil B* as dual-purpose cutting-lubricating oil in automatic screw machines, as a cutting oil for external milling and for hobbing small gears, Tuthill eliminated oil wastage and the necessity for frequent oil changes—and *sharply increased production between tool grinds.*

There is a complete line of *Texaco Cutting, Grinding and Soluble Oils* to help you do all your machining better, faster and at lower cost. Let a *Texaco Lubrication Engineer* specializing in machining help you select the proper ones for your operation.

Just call the nearest of the more than 2,000 *Texaco Distributing Plants* in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.



# TEXACO

## CUTTING, GRINDING, SOLUBLE AND HYDRAULIC OILS

TUNE IN: TEXACO STAR THEATER starring DONALD O'CONNOR or JIMMY DURANTE, on TV Sat. nights. METROPOLITAN OPERA radio broadcasts Sat. afternoons.



# Men in the News



Midland Steel Products Co.—Wade N. Harris was elected executive vice-president, and J. R. Almond was named vice-president of the Power Brake Div.



E. W. Bliss Co.—Robert Potter has been advanced to assistant executive vice-president, and C. A. Chamberlain has been named secretary.



Michigan Tool Co.—Clayton E. Scott has been appointed chief engineer, and A. D. Moncrieff was made manager of the Machine Tool and Cutting Tool Divs.

Studebaker-Packard Corp.—Ray P. Powers has been named vice-president of operations.

General Motors Corp.—Calvin J. Werner has been appointed general manager of the Moraine Products Div., succeeding Bernard A. Brown, retired. Bert T. Olson has been made manufacturing manager, and Robert L. Ganter is now divisional comptroller of Delco Products Div.

Plymouth Div., Chrysler Corp.—John H. Powell has been named director of planning, and Joseph Ondrus has become director of time and budget study.

Electric Storage Battery Co., Automotive Div.—Robert L. Sommerville was appointed general sales manager.

Bliss & Laughlin, Inc.—John M. Richards has been elected vice-president for operations.

Vickers, Inc.—Arthur H. Van Wormer is now district sales manager in Cleveland, O.

Chrysler Corp.—Wayne E. Grimm was named director of management development and Albert R. Walcott was made senior staff coordinator in the Management Development Dept.

Bulldog Electric Products Co.—Hugh V. Diamond, Jr., has been made sales and product counselor.



Willis Motors, Inc.—Charles A. Watson was appointed general sales manager.



R. K. LeBlond Machine Tool Co.—Harold J. Siekmann was appointed vice-president.

National Automotive Fibres, Inc.—John G. Bannister was elected first vice-president, and M. K. Leahy was elected vice-president in charge of manufacturing.

Dodge Div., Chrysler Corp.—Byron S. Snowden has been appointed director of advertising and merchandising-trucks.

Lord Mfg. Co., Chicago Div.—Kenneth L. Hanson has become regional field engineering manager.

Long Mfg. Co.—Thomas J. Ault has been appointed president, and Royden Walter has been named treasurer.

Regal Plastic Co.—L. I. Hadden has been appointed general manager.

Studebaker-Packard Corp.—Colonel J. G. Vincent, Packard engineering vice-president, has retired as an active member of the management group of the company.

Kaiser Aluminum & Chemical Corp., Aluminum Fabrication Div.—Richard T. Myer has been appointed chief metallurgist.

Dana Corp.—H. B. Bartlett was made a vice-president, and O. G. Garner became assistant secretary.

W. F. & John Barnes Co.—Ralph B. Billingham, Jr., has been named sales manager of the Automation Section.

## Necrology

Earl B. Wilson, 70, retired director of sales for Chrysler Div. of Chrysler Corp., died Dec. 4, at Birmingham, Mich.

Eugene du Pont, 81, a director of E. I. du Pont de Nemours & Co., died Dec. 14, at Wilmington, Del.

C. S. Comeaux, 65, executive secretary of the Plastic Coatings and Film Association, died Dec. 10, at Oklawaha, Fla.

John H. Frank, 55, budget manager of the MoPar Div. of Chrysler Corp., died Dec. 6, at Detroit, Mich.

Thomas E. Akers, 66, chairman of Dominion Brake Shoe Co., Ltd., died Dec. 5, at Niagara Falls, N. Y.

Joseph J. Lockwood, 81, former vice-president of American Brass Co., died Dec. 8, at Buffalo, N. Y.

Theodore M. Matson, 51, vice-president of the Institute of Traffic Engineers, died Dec. 15, at New Haven, Conn.

Harry O. Heller, advertising manager of Reed Roller Bit Co., died recently, at Houston, Tex.

Alvaro Krotz, 90, pioneer automotive inventor, died recently, at Rockton, Ill.

Alfred W. Lawson, 85, aviation pioneer, died recently, at San Antonio, Tex.

Maxwell E. McDowell, 60, retired head of the Tax Dept. of Standard Oil Co. of New Jersey, died Dec. 16, at Scarsdale, N. Y.

# THE FELLOWS METHOD... when

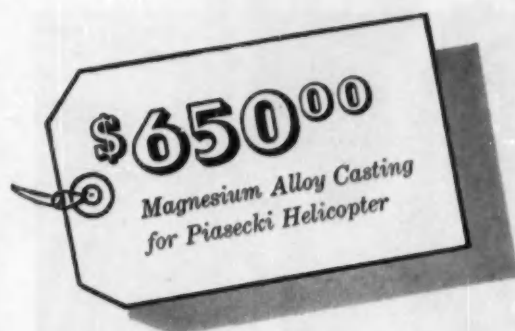


## GEAR SPECIFICATION

No. of Teeth (Internal) .....	222
D.P. ....	8/10
P.A. ....	20°
Pitch Diameter .....	27.750
Max. Involute Profile Error .....	.0006"
Max. Accumulative Pitch Line Error .....	.003"

THE *Fellows*

# you can't afford "rejects"



For an example, let's take a look at this transmission part that's used in a Piasecki Helicopter. It is an intricate magnesium alloy casting valued at \$650.00. Two 27.750 inch pitch diameter internal gears, with the teeth in line, have to be cut in the large end.

The lower internal is located close to the web. Tolerances are close for the nature and size of the piece. The necessity for keeping the percentage of "rejects" at a minimum is obvious.

The Steel Products Engineering Company of Springfield, Ohio cuts the gears in this piece on a Fellows Gear Shaper.

Using a 5-inch stroke of the cutter, both gears were cut at the same setting, thereby keeping the teeth in line. Cutting the internal close to the web was no problem because of the ability of the Gear Shaper to cut into a narrow recess. Tolerances were held because of the control of accuracy built into the cutter and the machine. Consequently, "rejects" were held to a minimum.

The Fellows Method affords versatility and cost economy. It produces profits by keeping quality up and costs down.

Ask any of our offices for information about the complete line of Fellows Gear Shapers, Shaving Machines and Gear Inspection Instruments.

## GEAR SHAPER COMPANY

*Head Office and Export Department: 78 River Street, Springfield, Vermont.*

*Branch Offices: 319 Fisher Building, Detroit 2 • 5835 West North Avenue, Chicago 39*

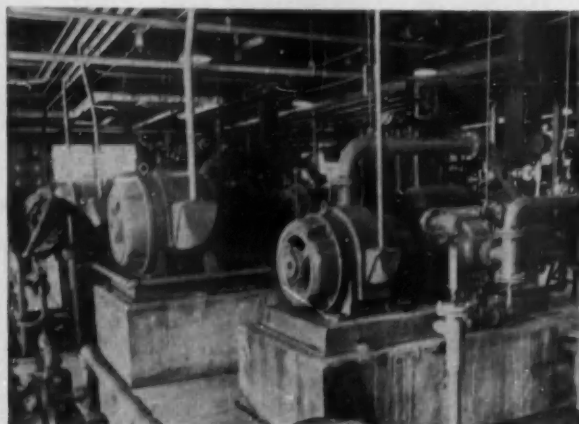
*5 Martel Building, 6214 West Manchester Avenue, Los Angeles 45, California*

*2206 Empire State Building, New York 1, N. Y.*

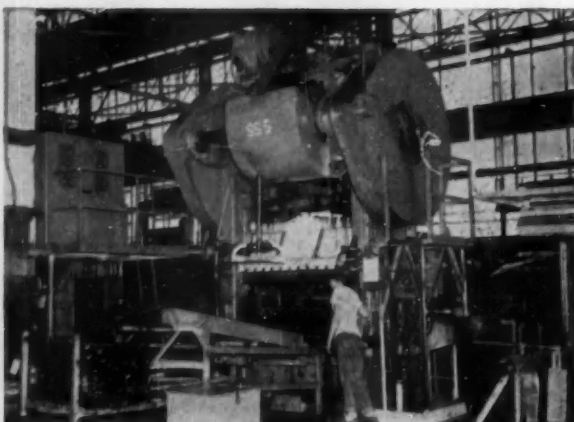
BUILT AND APPLIED BY RELIANCE

# THE Tools of Automation

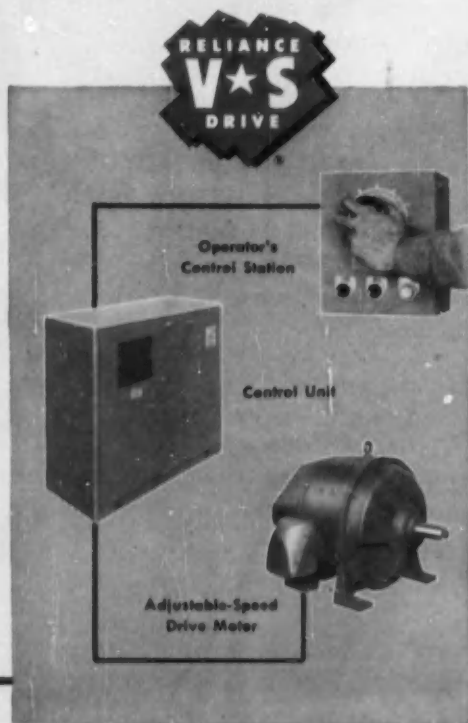
INCREASE PROFITS IN EVERY INDUSTRY



*Automation in refineries and the petro-chemical industries is made practical by the choice of the correct Reliance A-c. motors. They provide unfailing power for those processes which go unattended hour after hour.*



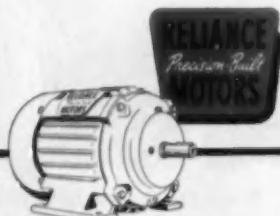
*On stamping presses Reliance V\*S Drives automatically provide proper metalworking speeds on each cycle, enabling parts to be produced to close tolerances at fast rates of production.*



Greater machinery output . . . improved production efficiency . . . both result in increased profits. And both result from using the Tools of Automation: Reliance electric motors, adjustable-speed drives, electronic controls, and applied engineering. They're setting new standards for low cost production in *every* industry.

These Tools of Automation can most efficiently lower your costs, because they're designed and applied to *your* specific situation. Reliance Application Engineers are backed by nearly 50 years' experience in perfecting the drive systems that can help you attain the degree of automatic production you require. For further information, write for the new booklet, "The Tools of Automation".

A-1487-D



**RELIANCE** **ELECTRIC AND ENGINEERING CO.**

Sales Representatives in Principal Cities



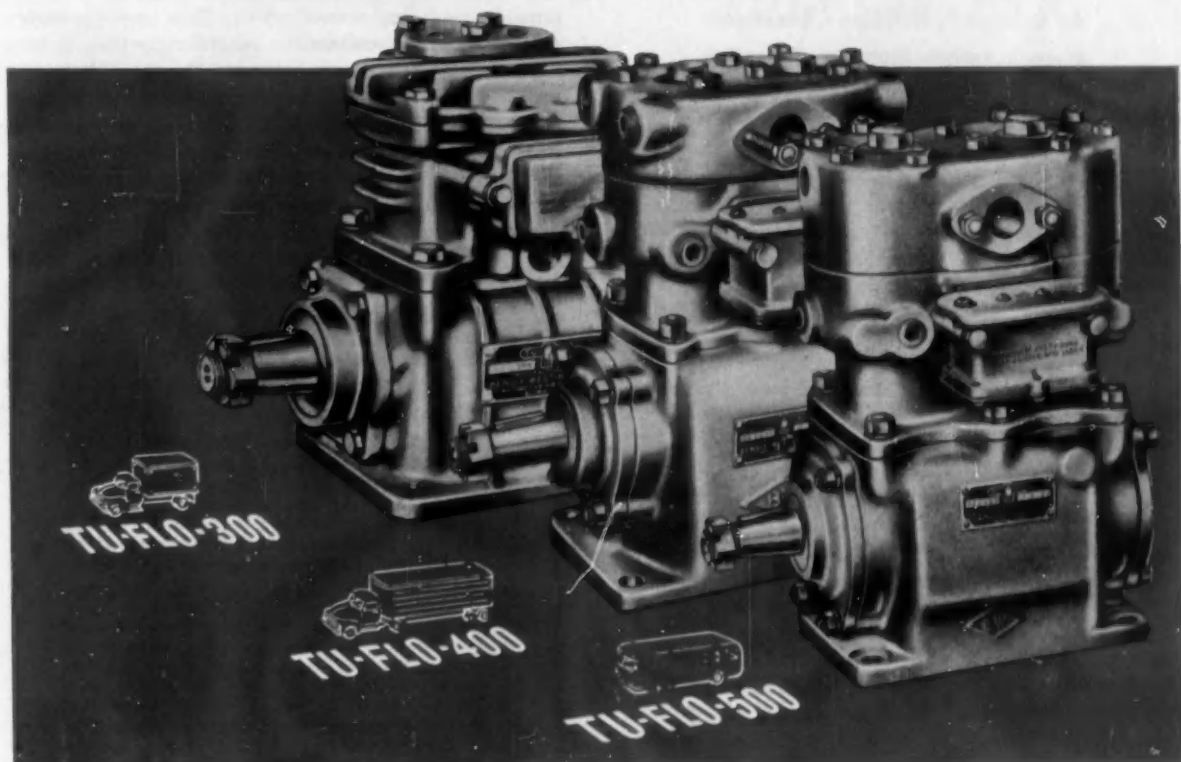
1123 Ivanhoe Road, Cleveland 10, Ohio



Announcing the NEW

# *Bendix-Westinghouse*

## **TU-FLO SERIES**



**A COMPLETE LINE OF SUPERIOR COMPRESSORS BRINGING THE HIGHEST EFFICIENCY AND BEST PERFORMANCE EVER OFFERED TO THE TRUCK AND BUS INDUSTRY!**

Here is an outstanding line of brand-new compressors for 1955—covering the entire range of trucks, tractors, buses and off-the-road equipment—from the smallest to the largest—with maximum braking performance assured every vehicle.

Road-tested for millions of miles—laboratory-tested for thousands of hours—job-tested and efficiency-rated from design boards to production final test—these are the finest compressors ever built for the automotive industry.

- Lower discharge temperatures over the entire speed range.
- Increased air delivery at low and intermediate speeds, where most required.
- Capable of operating at higher maximum speeds to match trends in engine design.
- Improved oil control.
- New-design inlet valves.
- New unloading mechanism.
- No external moving parts—no need for periodic adjustments.
- Available with attached governor, if desired.
- All compressors available either self-lubricated or engine-lubricated.
- Tu-Flo 300—air cooled.
- Tu-Flo 400—air or water cooled.
- Tu-Flo 500—water cooled.

# *Bendix-Westinghouse*

The World's Most Tried and Trusted Air Brakes

BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY

General Offices and Factory—Elyria, Ohio • Branches—Berkeley, Calif., Oklahoma City, Okla.



# Significant Economic Factors in the 1955 Automotive Picture

By George P. Hitchings, Manager  
Economic Analysis Dept., Ford Motor Co.

## General Business Conditions

**B**USINESS activity is on the uptrend in the fourth quarter after six months of relative stability at the moderately lower levels reached in the July 1953-March 1954 decline. Durable goods manufacturing, which has felt the brunt of the previous decline, is the primary factor in the current rise. Steel production has moved up steadily to about 80 per cent of capacity from the 66 per cent rate prevailing in September. Passenger car production has been boosted substantially because of strong consumer demand and low dealer stocks at introduction of the 1955 models.

This pickup in durable goods manufacturing—coupled with continuation of record levels of expenditure for construction, consumer non-durable goods and services, and state and local government purchases—provides a firm base for an expanded economy in 1955. The level of activity for the year 1955 is likely to be equal to that for 1953 as a whole, but will probably fall short of the peak rate reached in the second quarter of 1953. Furthermore, there will be greater slack in the economy than in the Spring of 1953, because of increases in the past two years in the labor force and in productive capacity.

A return to the conditions existing at the peak of the boom in the first half of 1953, however, would hardly be desirable for the long-run interests of the economy. At that time, a substantial amount of employment and incomes rested on temporary production of armaments and build-up of durable goods inventories previously held down by the Defense program and the 1952 steel strike. Prosperity based upon such factors cannot endure for long. Loss of more than \$22 billion annual rate of production for Defense and for business inventories precipitated the decline after July 1953.

## Recession Avoided

A drop of this magnitude could have generated a sharp recession like 1937-38 or 1920-21, or the 1929-30 initial stage of the depression. In these periods, cut-backs in production and employment gave rise to a cumulative downward effect on consumer and business spending, particularly in the postponable areas of

durable goods and construction. This time, however, total consumer spending and construction rose to new highs, and producer expenditures for machinery and equipment eased off only moderately from the Defense-stimulated level reached in 1953.

These results were achieved largely because of tax reductions, increased Government benefit payments,

(Turn to page 109, please)

## Military Spending to Rise in '55

Washington Bureau  
AUTOMOTIVE INDUSTRIES

**M**ILITARY purchasing in 1955 will be substantially higher than in 1954. The Eisenhower Administration's budget experts are now in complete—if somewhat reluctant—agreement that Defense Department buying of military hardware must now be stepped up to offset new threats of Communist aggression.

The Army, Navy, and Air Force combined have a total of about \$35,500,000,000 at their disposal in this fiscal year. This includes \$29,400,000,000 in new money. The balance is accounted for in funds carried over from previous fiscal years. The \$35,500,000,000 figure is about \$1 billion below what the military had requested of Congress. While it is premature to forecast the size of the sum to be voted by the Congress this Spring for spending in the fiscal year starting July 1, it is reasonable to believe that total spending will be closer to the \$35 billion mark. Secretary of Defense Wilson anticipates about \$34 billion in new money and the balance in unexpended funds from previous fiscal years bringing total outlays to about \$35 billion.

Uncle Sam, already the nation's biggest customer both in value and volume of goods and services, is therefore to become an even bigger one this year. This means more planes, more ships, more guns, more trucks, more tanks, more guided missiles and other new "robot" weapons.

A sizeable slice of the military spending dollar will go to the machinery industries. Congress in 1954 voted an appropriation of \$100 million to be spent exclusively on machine tools for military production. The Defense Department was slow to obligate the sum, but finally late in 1954 earmarked the biggest chunk of this fund for procurement of tools for Air Force contracts.

It is entirely possible that the Defense Department will ask Congress for a fresh appropriation (probably something less than \$100 million) to continue the tool-buying program beyond June 30 into fiscal 1956.

**By William J. Cronin**  
**Managing Director**  
**AUTOMOBILE MANUFACTURERS ASSOCIATION**

**T**HE automobile industry is looking forward to 1955 with a confidence solidified by its showing in the final two months of the current year. A sharp upswing in production, employment and sales has followed introduction of new passenger cars after the most sweeping model changes in many years. All signs indicate that November and December momentum will carry the industry to one of its best years.

Preliminary estimates indicate that 1954 itself will be the industry's fourth greatest year in terms of factory sales of passenger cars, trucks and buses. The final total of some 6,565,000 units compares with last year's 7,323,214. The all-time peak of 8,003,056 was reached in 1950.

Passenger car factory sales are scheduled to reach 5,530,000 units, the third best figure on record. This compares with 6,116,948 in 1953. A sharp rise in November factory sales—up more than 60 per cent from October's low of 221,195—coupled with a continued climb in December to send the year's total above 5.5 million.

Motor truck factory sales in 1954 exceeded a million units for the eighth straight year, totaling some 1,035,000. The figure for 1953 was 1,206,266.

The wholesale value of car, truck and bus sales reflected the decline in production, but remained high at some \$9,850,000,000. For passenger cars, the figure is estimated at \$8,100,000,000, and for trucks and buses, at \$1,750,000,000. A similar dip appears in the wholesale value of 1954 replacement part and accessory sales, estimated at \$1,650,000,000. In 1953, the totals were \$11,091,000,000 for cars, trucks and buses, and \$1,892,000,000 for replacement parts, etc.

Automotive industry employment in 1954 averaged some 745,000 for the year and was climbing rapidly as the year drew to a close. This compared with a record 920,200 during 1953, when defense employment continued at high levels. Average employment of production workers alone is estimated at 598,000 production workers in 1954.

Payrolls returned to the levels of 1951 and 1952, with the annual total for last year estimated at \$2,720,000,000. A record \$3,475,000,000 was reached in 1953.

In many other respects, 1954 was a record year in its own right. Motor vehicle registrations soared to an estimated 58,129,000, some 1.8 million above the record set in 1953. Passenger car registrations of 48,087,000, motor truck registrations of 9,792,000, and bus registrations of 250,000 were all new records.

Gasoline consumption also reached a new peak, 44 billion gallons, during 1954, while vehicle-miles traveled continued to climb to a record 566 billion.

Highway expenditures were at a record height, financed for the most part by a record levy of special vehicle taxes.

The capital outlay for all roads and streets during

# 1954 as Fourth Highest Year

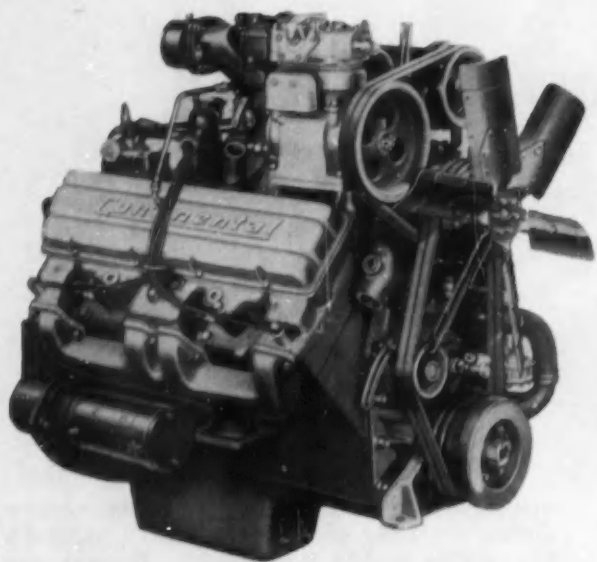
1954 is estimated at \$3,729,000,000, with maintenance, administration and interest charges of \$2,308,000,000 bringing the total to \$6,037,000,000. However, this impressive figure means only that U. S. road and street expenditures, in terms of stable dollars, now have passed the 1938 level of expenditures for the first time.

Total special vehicle taxes reached \$6,150,000,000 in 1954. Trucks alone paid \$1,775,000,000 in special taxes, a sum greater than all vehicles combined in any year prior to 1940.

## PRELIMINARY "AUTOMOBILE FACTS AND FIGURES"—1954

	1952	1953	Est. 1954			
FACTORY SALES—NUMBER						
Passenger Cars	4,320,794	6,116,948	5,520,000			
Trucks and Buses	1,218,160	1,206,266	1,035,000			
TOTAL	5,538,954	7,323,214	6,555,000			
FACTORY SALES—WHOLESALE VALUE						
Passenger Cars	\$8,455,114,000	\$9,002,580,000	\$8,100,000,000			
Trucks and Buses	2,319,789,000	2,088,060,000	1,750,000,000			
TOTAL	\$9,774,903,000	\$11,091,640,000	\$9,850,000,000			
REPLACEMENT PARTS AND ACCESSORIES, DOMESTIC MARKET, WHOLESALE VALUE				\$2,164,300,000	\$1,992,400,000	\$1,650,000,000
GASOLINE CONSUMPTION, MILLIONS OF GALLONS				40,985	42,732	44,000
VEHICLE MILES OF TRAVEL, (MILLIONS OF MILES)				512,242	549,707	566,000
EMPLOYMENT IN MOTOR VEHICLE MANUFACTURING						
Production Workers	644,400	759,900	598,000			
All Employees, Including Salaried	790,200	920,200	745,000			
ANNUAL PAYROLL IN MOTOR VEHICLE MANUFACTURING						
Production Workers	\$2,775,000,000	\$3,475,000,000	\$2,720,000,000			
SPECIAL TAXES ON MOTOR VEHICLES						
All Vehicles	\$5,315,228,000	\$5,960,524,000	\$6,150,000,000			
Motor Trucks	\$1,462,093,000	\$1,896,061,000	\$1,775,000,000			
HIGHWAY EXPENDITURES, ALL ROADS AND STREETS						
Capital Outlay	\$2,605,000,000	\$3,222,000,000	\$3,729,000,000			
Maintenance, Administration, and Interest	2,141,000,000	2,214,000,000	2,308,000,000			
TOTAL	\$4,746,000,000	\$5,436,000,000	\$6,037,000,000			
MOTOR VEHICLE REGISTRATIONS, DEC. 31, (Including Publicly Owned)						
	Passenger Cars	Trucks	Buses	Total		
1952	43,810,831	9,243,620	240,142	53,294,593		
1953	48,480,984	9,600,924	244,251	58,326,159		
1954	48,087,000	9,792,000	250,000	58,129,000		

Source: Automobile Manufacturers Association.

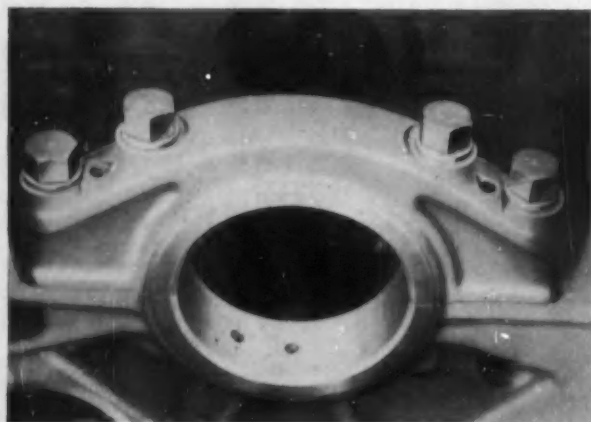


Right front quarter view of the V8603 gasoline engine

**F**OLLOWING an extended period of time devoted to design, development, and testing, Continental Motors Corp. has launched a family of heavy duty, short stroke, V-8 engines of advanced design, featuring exceptional compactness. They are offered in versions suited to a wide range of transportation, marine, and industrial applications.

The line includes the V8603, a 240-hp gasoline model, the V-603 industrial version, and the VD8603 Cushioned Power Diesel which is rated 182 hp. The description that follows applies to the V8603 gasoline transportation engine. Except for mounting arrangements, the same data applies to the V603 industrial version. Condensed mechanical specifications are given in tabular form.

The VD8603 Diesel engine has the same mounting



Main bearing caps are copper chrome alloy iron, held in place by four heat-treated cap screws

## Continental's New For Wide Range of

Diesel Develops 182 Hp,  
Gasoline Models 220 and  
240 Hp

dimensions and approximately the same space requirements. While many of the major components, such as the cylinder block, crankshaft, bearing caps, etc., are interchangeable, the Diesel version involves some natural differences.

For example, the cylinder heads are the Continental cushioned-power combustion chamber arrangement, together with the Diesel fuel injection system; there is a different intake manifold and different piston design, etc.

The basic V8603 gasoline engine, shown in transverse cross-section, is a 90-deg V-8 with backbone consisting of a one-piece cylinder block of high quality chrome-molybdenum alloy iron, heavily ribbed and designed for maximum strength and rigidity. The crankcase section is split below the center of the main bearing line for added strength. The casting is normalized to produce the desired physical properties.

The cylinder head, too, is of chrome molybdenum alloy iron, of massive form to provide strength and rigidity at the top end. It has liberal water passages for good cooling around the valves, combustion chamber, and exhaust passages. The head is fastened with long bolts, fitting in heavy bosses located away from the cylinder barrels to preclude distortion.

Pistons are of aluminum alloy, tin-plated, with expansion control, and have a thick domed head. The ring setup consists of three compression rings, and one oil ring, the top ring being hard chrome plated. Full-floating piston pins, 1½ in. in diameter are employed.

Connecting rods are drop-forged and heat treated, 8⅜ in. center-to-center, with steel-back replaceable bearings of copper-nickel matrix with high-lead base babbitt overlay.

The five-bearing counterweighted crankshaft, made of high quality selected steel, is drop-forged and heat treated, with Tocco-hardened bearings, is magnafluxed and dynamically balanced. The replaceable main bearings are of steel-backed type with copper-nickel matrix, and high-lead base babbitt overlay. Thrust is taken



# V-8 Engines Applications

on the flanged center bearing, no shims or washers being required to control end play.

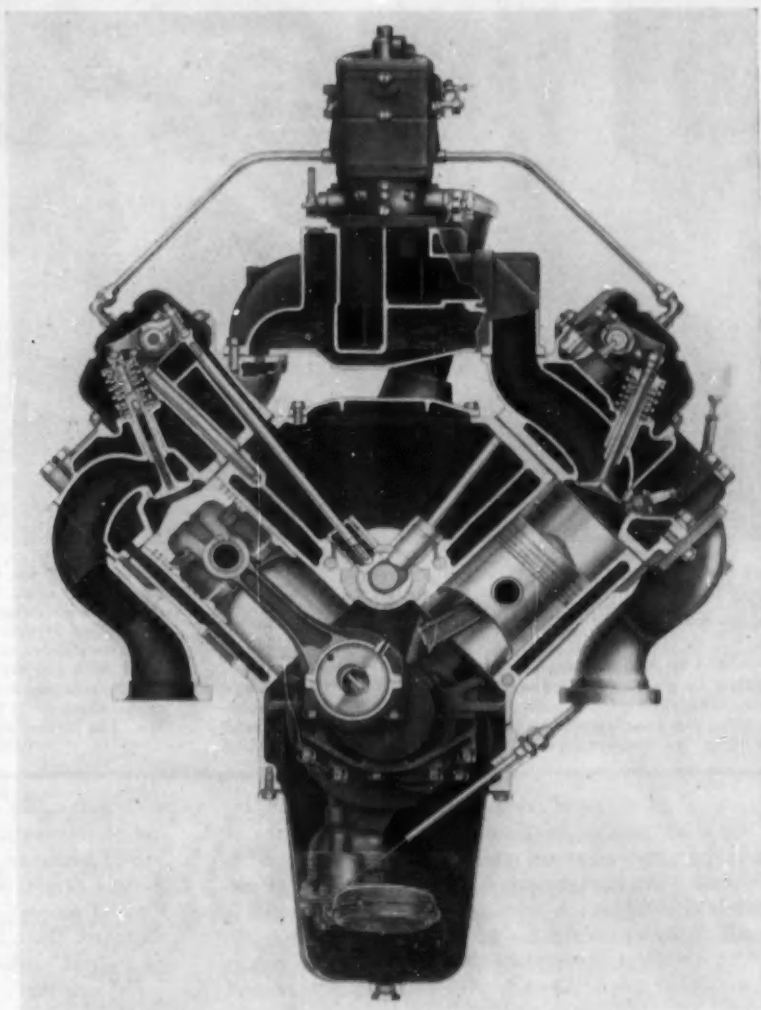
The massive main bearing caps are of copper chrome alloy iron, held in place rigidly by means of four heat-treated steel cap screws.

Intake valves are of alloy steel with head diameter of 2 13/32 in. Exhaust valves are of austenitic steel, sodium-cooled, Stellite-faced, Bright Ray treated, and fitted with a positive rotation mechanism. Exhaust valves operate in valve seat inserts of alloy steel. Nested valve springs are employed to provide proper action.

As shown in the transverse sectional view of the engine, the valve mechanism is actuated by hollow push rods, operating in mechanical barrel type tappets, the latter being readily removable from overhead without dropping the oilpan or removing the camshaft. The five bearing camshaft is drop-forged and heat treated, and fitted with replaceable steel-back precision bearings, babbitt-lined. Intake valve lift is 0.512 in., exhaust 0.505 in. A special high speed camshaft is an available option.

The gasoline induction system consists of a 1 3/4-in. duplex downdraft type carburetor, mounted on an amply water-jacketed intake manifold for controlling the temperature of the air-fuel mixture under all operating conditions. The fuel-air mixture enters the cylinders through individual, streamlined ports. Provision is made for a mechanical diaphragm type fuel pump, driven from the camshaft in front.

(Continued on next page)



Transverse cutaway view of the basic V8603 gasoline engine showing details of the valve train, piston design, etc.

## Condensed Mechanical Specifications CONTINENTAL MOTORS V-8 ENGINES (90-Deg. Overhead Valve Design)

Model	V-8603 (gasoline)	V-603 (gasoline)	VD-8603 (Diesel)
Bore (in.)		4 3/4	
Stroke (in.)		4 1/4	
Displacement (cu in.)		603	
Compression Ratio (gasoline)		7 to 1	
Bhp, bare	240 @ 3200 rpm, gov.	220 @ 2800 rpm, gov.	182 @ 2800 rpm
Torque (lb ft) max.	500 @ 1400 rpm	500 @ 1400 rpm	500 @ 1400 rpm
No. main bearings		5	
Bhp/cu in. Ratio	0.398	0.364	0.302
Weight (lb) approx.	1612		



## New Features of 1955 Nash

The 1955 Nash Ambassador and Statesman models are highlighted by a wrap-around windshield, new front fenders and hood, together with a new die-cast oval grille which incorporates the headlamps. Ambassador models will be powered by either an overhead valve six with dual carburetion which

develops 140 hp, or by a 320 cu in. V-8 which develops 208 hp at 4200 rpm. Its bore is 3 13/16 in., stroke 3 1/2 in., and compression ratio is 7.8 to 1. A two-barrel carburetor is used. The Hydra-Matic transmission will be optional with the six-cylinder engine; Ultramatic will be standard equipment with the V-8. The Statesman will have an L-head, six-cylinder engine which develops 100 hp with a single throat carburetor, or 110 hp with an optional two-barrel carburetor. The Hydra-Matic transmission is optional equipment on the Statesman.

(Continued from previous page)

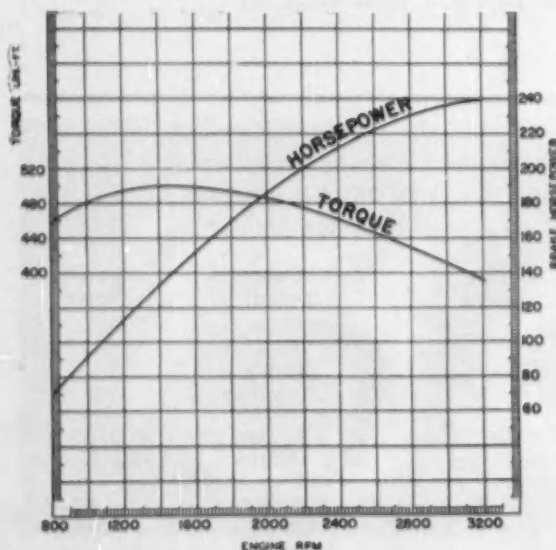
Speed of gasoline engines is controlled by means of an externally-mounted mechanical governor, dust-proof and engine-lubricated, containing but one external adjustment. A wide operating speed range is available by changing the governor spring.

The electrical system includes the following: generator—either 12- or 24-volt, with optional voltage regulator; 12-volt starter with No. 2 SAE mounting, on the right hand side; 14 mm spark plugs; distributor

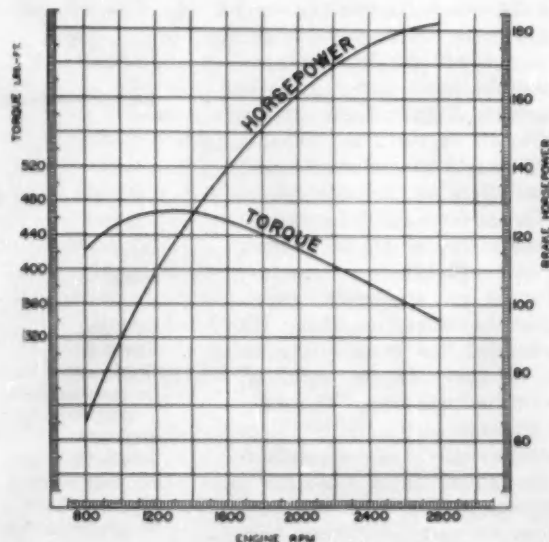
with automatic spark advance, mounted at the rear end of the engine. Hand starting also is available.

Full pressure lubrication is supplied, using a submerged gear type oil pump used in conjunction with a Float-O screen. An oil cooler of integral tube type is standard, the oil filter being an extra cost item. The oil pan, of pressed steel, is of 12-qt capacity.

Exhaust manifolds, fitted on each bank, are of down-draft type with center outlet, made of chrome molybdenum alloy iron.



Bare engine performance of the V8603 gasoline engine in accordance with I.C.E.I. and S.A.E. test codes



Bare engine performance of the VD8603 Diesel in accordance with I.C.E.I. and S.A.E. test codes

# AUTOMATION NEWS REPORT

← FEEDBACK →

**AUTOMATIC CONTROLS**  
**PRODUCTION — VEHICLES — AIRCRAFT**

**By Paul Kennedy**

## WHAT IS AUTOMATION?

Everyone seems to have a definition, and hardly two are alike. They range from "work transfer" to "a factory without people." Here are the ideas of some engineers who use the term frequently:

"I want to think of automation as a new concept — a new philosophy — of manufacturing," said D. S. Harder in a recent speech.

Mr. Harder, vice - president - manufacturing, Ford Motor Co., coined the word in 1947. He explained that with machines capable of turning out parts more rapidly than they are doing, automation has expanded "... from a simple definition involving automatic handling between operations to a concept which embraces our planning for all manufacturing processes." He gave high praise for the present success of automation to manufacturers of machine tools, electric motors, electric controls and hydraulic controls.

A recent survey of some 400 industrialists reveals the acceptance of the word. Automation embraces, they said: Automatic handling of materials; control of temperature, pressure and velocity; automatic processing; assembly of parts; measurement of variables; operation of aircraft and missiles; receiving, storing, and shipping functions; computing and data handling; control of household devices and cost accounting. The survey was made for Minneapolis-Honeywell's Industrial Div. "Automation," they agreed, signified "the automatic performance of a controlling function by mechanisms instead of men. This automatic control is obtained through measuring and correcting variables by instruments and mechanisms, with no human intervention" (except, of course, to set up the operation and correct malfunctions). The survey revealed that many engineers think of "control" and "instrumentation" separately, and both as a part of automation.

## BOLDNESS MUCH NEEDED

Automation's rewards can be best realized if management boldly experiments with new techniques and equipment and refuses to let its attention be diverted to the immediate details of

mechanism and men, said George M. Muschamp, vice - president, engineering, for Minneapolis-Honeywell's Brown Instruments Div. To take full advantage of automation, he added, requires "a tolerance of so-called novelty and theory." Muschamp told executives attending an engineering-productivity session sponsored by the Society for the Advancement of Management in Philadelphia last month that they should "adopt a do-it-yourself attitude" and study new techniques and equipment rather than wait for equipment makers or consultants to diagnose their problems and prescribe cures.

## STIMULUS TO IMAGINATION

To promote increased plant efficiencies, including automation, Muschamp suggested that management stimulate the imagination of its industrial engineers, allow them greater freedom and thus encourage them to develop such new technologies as automation. Engineering, he maintained, must not be relegated to device-designing or tool-producing roles.

Process industries undoubtedly used the control aspect of automation earlier than did other industries. Paul D. Barton, chief engineer of Sun Oil Co., discussed management's viewpoint of automation at a symposium on the automatic plant, sponsored by the Instrument Society of America in connection with the ASME National Power Show last month. Basically, he said, automation is "... the application of a relatively few mechanical electrical and hydraulic prin-

*(Turn to page 102, please)*

## A·U·T·O·M·A·T·I·O·N

AUTOMOTIVE INDUSTRIES for many years has been reporting the applications and progress of automation and other forms of automaticity in automotive and aviation plants. Within recent years this trend of automaticity has been accelerated to the extent that an industry of considerable size and consisting of several hundred companies now manufacture automatic control mechanisms and allied instrumentation for production equipment, aircraft and motor vehicles. So beginning with this issue, news and new developments in this industry will be presented as a special feature in each First of the Month Issue of AUTOMOTIVE INDUSTRIES. Heretofore this editorial material was published on various pages. Descriptions of new installations of automation equipment in the plants will be continued in feature articles as previously. —Ed.



# Aircraft Industry Activities *to Continue at*

The requirement for investment in facilities will continue through 1955 even though the scheduled expansion of plants and equipment for volume production has been virtually completed. The revolutionary advances in aeronautical science during the past decade have imposed a mounting need for acquiring and modernizing the research and test equipment and facilities essential to the creation of today's advanced, high performance aircraft, both military and civil.

The coming year will see an appreciable improvement in the combat capability of our Nation's air arms, as deliveries of new high performance models are increased. By the end of the year the United States Air Force is scheduled to be more than 95 per cent and our Naval air arms 80 per cent modernized.

## Production and Sales in 1954

Perhaps the most significant aspect of the aircraft manufacturing industry's activity during 1954 was the unusually stable level of its operations. Although unit production of military aircraft declined gradually during the year, the industry's output of airframe weight was approximately the same as that of 1953—some 150 million pounds. This continued high level of activity was reflected in sales of aircraft, aircraft engines, propellers and spares, which are estimated at \$8.6 billion for the year compared to \$8.5 billion in 1953. Sales volume of the twelve largest airframe companies is expected to be on the order of \$5,200,000,000 to \$5,300,000,000 for 1954, compared to 1953 sales of \$5,120,100,000. This is the largest volume of sales reported by these companies since World War II.

Deliveries of military aircraft, representing 85 to 90 per cent of the industry's effort, averaged slightly less than 900 planes per month—a total of some 10,500 to 10,800 units for the year. This decline in unit deliveries was expected and marks the beginning of the transition from the buildup to the maintenance and modernization phase of the Nation's air remobilization program. The downward trend in deliveries be-

**A** DOWNWARD trend in monthly unit production of military aircraft began in 1954 and is expected to continue through 1955, although it is difficult to forecast accurately the rate of decline. It seems probable that monthly deliveries (now about 900 units) will, by December, 1955, be somewhere near 800 units. A reasonable assumption for total military aircraft production for the year would be some 9700 to 10,000 units.

Although production of civil air transports is not expected to equal the high level that was reached in 1953 and 1954, U. S. manufacturers today have unfilled orders for 175 large commercial planes and are expected during 1955 to continue their leadership in the world civil aircraft market. Unit production of utility airplanes is expected to be about the same as 1954 and production of helicopters for commercial use is expected to increase.

Although the industry's activities, measured in terms of sales, employment and production of airframe weight are expected to be below 1954 levels, the decline will not be proportionate to the reduction in unit deliveries. Sales of \$7,900,000,000 to \$8,100,000,000 are in prospect, with the sales volume of the 12 largest airframe manufacturers again expected to be on the order of \$4,800,000,000. Employment is expected to continue at a high level with the average for the year being some 755,000 workers. There is no prospect for the diminishment in the severe shortage of engineers and certain skilled technicians.



By Admiral DeWitt C. Ramsey, USN (Ret.)  
President, Aircraft Industries Association

## HIGH LEVEL in '55

gun this year is expected to continue into 1956-57, at which time, according to current programs, the maintenance level will be reached. However, it is pertinent to note that employment, sales and pounds of airframe produced, will not decline to the same degree as unit production for the following reasons: (1) aircraft now being built are heavier, (2) an increasing amount of the production effort of the aircraft manufacturing industry is being devoted to guided missiles, and (3) research and development is going forward at a relatively high level.

In January, 1954, employment reached a total of 830,100, making the aircraft industry America's largest manufacturing employer. From this peak employment has gradually declined to a figure of 797,400 for September, 1954, the last month for which these statistics are available. This high level of employment coupled with the fact that the average annual earnings of aircraft employes has increased to \$4414 (up \$953 since June, 1950), makes the aircraft industry's 1954 payroll \$3,500,000,000, the largest manufacturing payroll in the United States.

The relative stability of the aircraft industry's programs during the past two years has contributed substantially to economy and efficiency in the production effort, and to the creation of a sound production base.

In contrast to the emergency period immediately following outbreak of the Korean War, when problems of materials shortages and facilities expansion demanded a high order of priority the industry has been able to place increasing emphasis on improvements in manufacturing methods and on cost-reduction efforts.

Both the Government and the industry have had an opportunity under these conditions to concentrate on quality and reliability of products. A striking example of savings lies in the reduction of jet engine requirements incident primarily to substantial increases in time between overhaul.

At year's end, virtually all combat aircraft in production were jet-powered. Production had begun on at least seven highly-advanced supersonic fighters and one supersonic bomber. Deliveries of medium jet bombers to the Strategic Air Command passed the 1000 mark in 1953, and deliveries began on a heavy

jet bomber, capable of near-sonic speeds and extremely long-range operations. In the development and production of guided missiles, another field of primary responsibility for the industry, substantial progress was being made, with at least 26 different models in production or service test stage.

### Military Aircraft Production

Although security restrictions preclude the release of detailed information on the industry's activity in the defense field, military plane output is estimated at approximately 10,500 to 10,800 units of all types during 1954.

This brings the total of military aircraft produced since the start of Korean hostilities to an estimated 37,500-37,000 units. By years, the estimates are:

1950—slightly less than 3,000

(of which some 1,500 were built after June 1950)

1951—more than 5,000

1952—approximately 9,000

1953—approximately 11,500

1954—approximately 10,500—10,800

The percentage of combat type (fighters and bombers) continued to increase as did the percentage of jet powered planes.

### Civil Aircraft Production

Civil aircraft production continued at a substantial rate during 1954. Sales of American made transports continued to lead the world as transport manufacturers delivered some 325 units of which about 130 were twin-engined executive types and 195 were 36-passenger or larger types.

Dollar volume of sales and airframe weight of utility airplanes produced increased over 1953, although 1954 deliveries were estimated at 3,075 compared to 3,825 in 1953. Sales for the year are estimated at \$40,000,000 compared to \$34,458,000 in 1953, and an increase in airframe weight from the 1953 total of 10,768,000 pounds to 12,500,000 pounds for 1954 is in prospect. The increase in dollar volume and airframe weight does not reflect greatly increased prices, but results from the fact that larger and heavier aircraft, notably the new twin-engine aircraft first offered in quantity this year, have been much in demand.

Helicopter production continued at a healthy level throughout the year. Although most of the helicopter deliveries were for military customers, manufacture of these types for civil purposes increased steadily.

### Employment

As previously indicated, employment reached a peak of 830,100 early in the year and thereafter began a gradual decline to 797,400 in September. By year's  
(Turn to page 102, please)



*Completely restyled Packard 400, newest hardtop entry in the luxury car field.*

## Engineering Features of 1955 Packards

**P**ACKARD and Clipper automobiles for 1955 offer completely new V-8 engines; a Twin-Ultramatic transmission; and, on Packard and Clipper Custom models, a unique torsion bar suspension for all four wheels. Styling is new and a wide selection of body styles is available. All cars will have 12-volt electrical systems.

Although a family resemblance has been retained, Packard and Clipper models portray distinctively different styling concepts. Both lines have sweep-around windshields. Parking lights on Packard models are set extreme outboard and wrap around the sides of the car.

Packard models utilize a vertical curved side pillar at the windshield. Rear fenders are trimmed to give the appearance of an air opening at their front end, and the lower portion of trim incorporates an exterior courtesy light for passengers entering or alighting from the car.

Headlights on Clipper models are hooded by long fender forms. A lower and wider grille highlights a Packard identification in a chrome header bar. This bar then wraps around the side of the fenders to become chrome treatment for the sides of the cars.

All cars will continue to be offered with tubeless tires as standard equipment.

The new Twin-Ultramatic is standard equipment on all Packard models; optional at extra cost on Clipper models. One of the unique features engineered into this transmission is dual-range performance at the option of the driver. Drive position has two options—high range torque converter direct

drive; and high torque converter coupled with a 1.82 to 1 ratio low gear. The latter position always returns the drive to full direct, shifting to high acceleration only as required. A complete description of the Twin-Ultramatic will appear in an early issue of *AUTOMOTIVE INDUSTRIES*.

### **Torsion Bar Suspension of Completely New Design**

**A** UNIQUE system of full torsion bar suspension has been introduced by Packard for its Clipper Custom Line and Packard cars. Although torsion bar suspensions have been employed by European cars for many years, the Packard suspension is completely new and does not resemble any mechanism used heretofore.

The suspension has many distinctive features, some of which may be noted briefly at this point. In the first place, it employs two full length torsion bars, one on each side, extending generally lengthwise of the frame side rail. Both front and rear wheel ends are connected to the same bar, the distinctive feature being that while front wheels are sprung independently the rear suspension retains the standard rear axle. This is in contrast to European practice and prevailing ideas as to the need for a swinging rear axle construction.

The second basic new ingredient is the Levelizer feature. As will be shown later, the suspension incorporates auxiliary devices that automatically maintain the loaded height to close limits, and level of the



By  
**Joseph  
Geschelin**

**Clipper Custom four-door sedan. It is powered by a 245-hp V-8 engine and features full torsion bar suspension.**

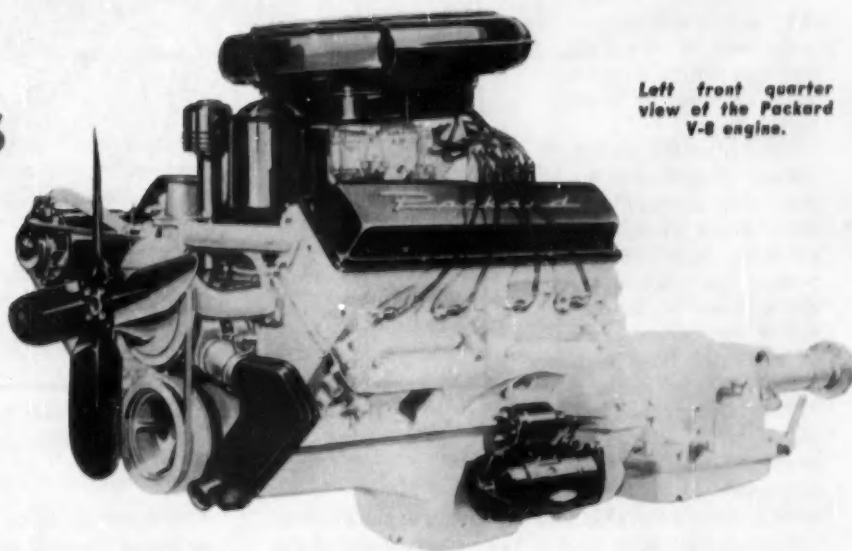
## and Clippers

vehicle front to rear regardless of changes in passenger loading.

Before going into a description of the elements of the mechanism, it may be of interest to outline some of the special claims made by Packard as follows:

1. It provides a flat ride with greatly reduced pitch, and practically eliminates bottoming.
2. The car remains level front to rear at all times. For the first time this makes possible precision headlamp aiming on the highway.
3. While providing a soft ride, the system is said to have excellent stability at high speeds, and splendid cornering control.
4. No rear end squat on acceleration; less pitch at rear under severe brake application.
5. Better wheel traction on acceleration due to automatic added loading on the rear wheels.
6. Torsional stresses resulting from spring action isolated from the frame.

With these claims in mind, let us consider some of the basic details of the system. First of all, the main spring action is taken by the nine-ft long torsion bars, each of which runs generally along the frame side rails. At the front end the suspension details remain about the same as before, except for some changes in the outer vertical support pivot bearings. The front



**Left front quarter view of the Packard V-8 engine.**

end of the main torsion bar has a lever pointing outward, connected by an anti-friction link to the front suspension lower support.

At the rear end, the lever on the end of the torsion bar points inwardly, and is connected to the rear axle torque arm by means of an anti-friction link.

Attachment of the torsion bars to the frame is accomplished by pivoting the front end lever on anti-friction bearings mounted on the frame front cross member; pivoting the rear end lever on anti-friction bearings in a bracket on the frame side rail at the rear. It is important to note that unlike other torsion bar suspensions this one does not anchor the bar to the frame at any point.

As a result, any upward movement of a wheel at either end of the main torsion bar spring will increase the torsional deflection of the bar and thus increase the load on both wheels simultaneously. Downward movement of either wheel reduces the load on both

wheels. Front and rear wheels on each side of the vehicle thus receive their main loads from the action of the same spring.

To transmit the forward thrust of the rear axle to the frame, the system employs two driving torque arms, one on each side. They are attached to the frame at the forward end by means of rubber bushings; at the rear axle housing by means of insulated rubber mounts. This allows free vertical movement of the axle, and transmits a minimum of noise or shock to the frame.

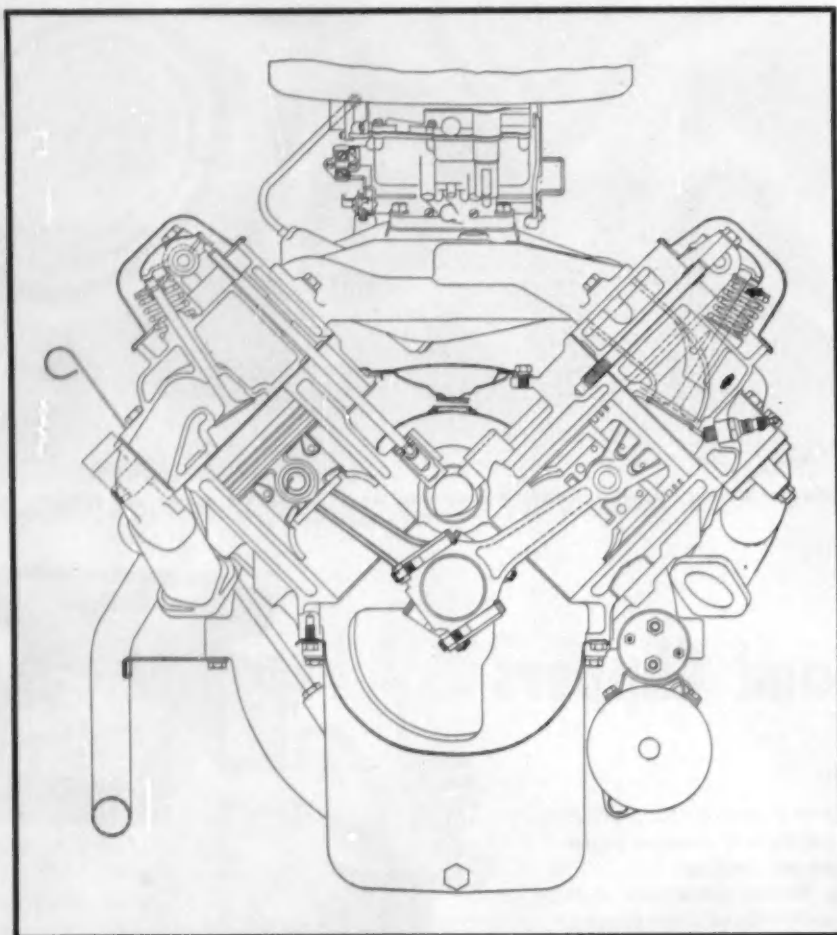
Load from the torsion springs is applied to the rear axle through the rear torque arms. The swinging ends of the torsion bar rear levers are attached to the center of the torque arms by means of links with anti-friction bearings.

The arrangement of torque arms plays an important role in this suspension. Due to reverse torque on the axle housing during rapid acceleration, the torque arms tend to raise the rear end of the car, thereby preventing rear end squat.

Transverse movement of the rear axle, on the other hand, is controlled by two transverse stabilizers, so designed as to permit true vertical movement of the body and to insulate lateral wheel shocks from the frame.

The car Levelizer or load compensator comprises two additional half-length torsion bars, a two-way actuator motor, gear box, control switch, and associated levers and links. Each compensator bar has a lever at the front end, pointing downward, connected by a link to a centrally located actuator lever and gear box. At the rear they are fitted into each of the torsion arms near the point where the arms are attached to the main torsion bar. Function of the compensator is to adjust compensator torsion bar loading in accordance with load changes in the car, the loading being increased or decreased by action of the motor.

Heart of the automatic control system is the switch which controls the action of the two-way motor. The switch is connected, by means of a link, to a lever attached to the left main bar. In normal operation,



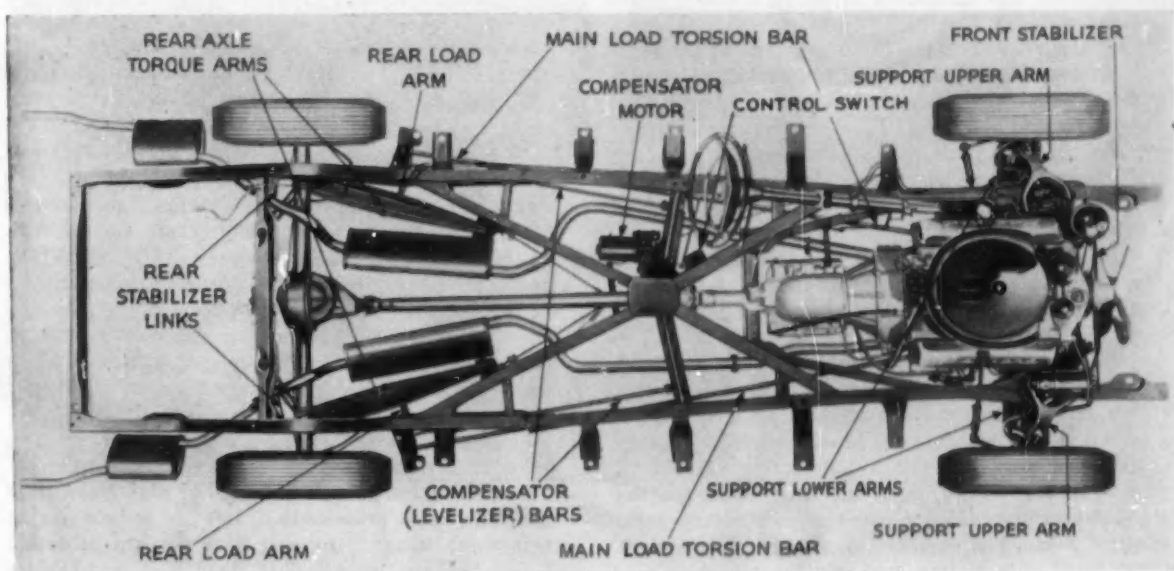
*Transverse sectional view of the new V-8, overhead-valve engine.*

with relatively equal loading front and rear, the center section of the long spring has substantially little movement, since equal twisting forces are applied at each end. However, if the loading at the rear is increased, the center section of the main spring will tend to deflect correspondingly. This will rotate the switch lever, cause the switch to make contact and operate the actuator motor, and thus will increase the loading on the compensator bars. Since these bars are so arranged as to raise the rear end under such conditions, they will level the rear end with the front.

On the other hand, if the loading on the rear is decreased, as would occur when passengers leave the car, the center section of the load spring deflects in the opposite direction. This contrary movement, when sensed by the actuator switch, will cause the actuator motor to run in reverse rotation, thus decreasing the loading on the compensator bars. Obviously, in this instance, the compensator bars tend to lower the rear end so as to level it with the front.

It may be appreciated that if the compensator mechanism were too sensitive, it would be affected by momentary variations in loading due to the action





Layout of the torsion bar suspension used on Packard and Custom Clipper Models.

of road bumps or brake applications. To prevent compensation for such transient effects, the switch has a six-second delayed action to cancel the effect of road bumps; and the motor circuit is arranged to be broken by a two-way stop light switch, to prevent compensator operation when brakes are applied. A safety switch or limit switch is also incorporated in the control circuit to automatically stop the motor after it has lifted its rated capacity. The limit switch also prevents damage when the car is lifted by the bumpers.

### New High-Output V-8 Engines

PLANNED back in 1946, the family of high torque, high efficiency, valve-in-head Packard V-8 engines for 1955 has had the benefit of a long range look at the course of modern engine development; and its basic design has been proof-tested on the dynamometer, the Packard Proving Ground, and on the highways.

The end product, to be described here, is a basic engine featuring high torque and horsepower, large displacement—to achieve high torque at middle range speeds—and what is said to be exceptionally low friction, high thermal efficiency, and noteworthy fuel economy. An outline of condensed mechanical specifications will be found in tabular form elsewhere in this article.

The basic cylinder block is a one-piece alloy iron casting, designed for maximum strength and rigidity. Additional rigidity is imparted by five rugged and heavily ribbed webs extending upward from the main

bearing line, as well as by wall reinforcing ribs and oilpan bolt bosses. Cylinder bores are completely surrounded for their full length by water jackets. Cylinder head bolt bosses are cast along the outside walls to avoid cylinder distortion, permitting use of a thin, all-steel cylinder head gasket.

It is of interest to note that cylinder spacing has been made deliberately greater than necessary for the initial bore sizes. While this does not make for the compactness inherent in this design, from a long range standpoint it affords greater flexibility in meeting future requirements by way of increased bore sizes, without necessitating changes in pattern equipment or tooling.

Noteworthy, too, is the degree of interchangeability

### 1955 PACKARD V-8 ENGINES Condensed Mechanical Specifications 90-Deg Valve-in-Head Type

Model	Clipper Super and De Luxe	Clipper Custom Line	Packard
Bore (in.)	3 1/16	4	
Stroke (in.)	3 1/2	3 1/2	
Displacement (cu in.)	320	352	
Compression ratio	8 to 1	8.5 to 1	
Bhp (max.)	225 @ 4600 rpm	245 @ 4600 rpm	260 @ 4600 rpm
Torque (lb ft) max.	325 @ 24-2800 rpm	355 @ 2400-2800 rpm	
Carburetor	All four-barrel type		
No. main bearings	Five		
Engine weight (approx.)	650 lb		
Ratio-bhp/cu in.	0.703	0.696	0.739
Ratio-torque/cu in.	1.015	1.008	

of major parts among the three engines. At the present writing, the cylinder heads, connecting rods, camshaft, connecting rod and camshaft bearings, and valve train are the same. Even the crankshaft—now made of an alloy iron casting—is the same from the standpoint of most machining operations, although differences in balance prevent interchangeability of finished crankshafts.

Cylinder heads are of alloy iron in a casting of deep, rugged construction, symmetrical in form to make right- and left-hand heads interchangeable. The geometry of the combustion chamber is quite unique, resulting from the initial compression ratio of 8.5 to 1, as well as use of large diameter side-by-side valves. As illustrated, it is uniquely shaped in plan with a favorable spark plug location, the plug being located in a large boss within the chamber. The spark plug is of new design, featuring long reach, i.e., the electrodes project directly into the highly compressed mixture area. The combustion chamber has a relatively large quench area and provides a high degree of turbulence.

A noteworthy feature of head design is the elimination of removable valve guides, the valves operating in bores of the parent casting. Heat transfer is improved to such extent that valve operating temperatures are said to be reduced by more than 200 F at the valve head, by more than 100 F at the stem.

The upper face of the head has a smooth, machined high wall to which the valve cover is attached by seven cap screws, compressing a thick cork gasket to provide a good oil seal.

## VALVE TRAIN DESIGN

**S**IDE-BY-SIDE valve arrangement has made possible the development of a short, light-weight, compact valve train with minimum inertia and deflection. Intake valves are of Silchrome steel, hardened and tempered all over, with effective valve port diameter of 1.937 in. Exhaust valves, on the other hand, are of flexible head design, said to readily conform to the shape of the valve seat, hence are highly resistant to pitting and burning. Made of austenitic steel, they have an effective valve port diameter of 1.687 in. Maximum valve lift, both intake and exhaust, is 0.373 in., the combination of high valve lift and special design of the induction system making for high volumetric efficiency.

Neoprene valve spring seat seals are fitted on both valves to control the volume of oil for lubricating valve stems, preventing excessive oil from entering valve ports.

The valve train consists of the chain driven camshaft, stub type hydraulic valve lifters, light-weight tubular push rods, rocker arms, and a rocker shaft on each head. The new camshaft is an alloy iron precision casting. Cam lobes are so shaped as to give the longest period of dwell for valve opening, and quiet ramps for valve opening and closing. Five steel-backed, precision type babbitt lined bearings support the camshaft. Cam lobes are ground with a slight taper, while the valve tappet foot has a large spheri-

cal radius to effect a slight amount of tappet rotation. The camshaft is driven by a one-inch silent chain, the sprocket being of hardened cast iron, the camshaft sprocket of hardened alloy steel. A pressed steel hard chrome plated eccentric at the front end of the camshaft actuates the fuel pump.

Departing from conventional practice, the five-bearing crankshaft is an alloy steel precision casting with six integrally-cast counterweights. It is 27.344 in. long and weighs only 53 lb. Additional torsional rigidity is imparted by providing for bearing journal overlap of  $\frac{5}{8}$  in. Main bearing journals are  $2\frac{1}{2}$  in. in diameter, crankpins are  $2\frac{1}{4}$  in. in diameter. Main bearings are steel-backed, babbitt lined on the Clipper Super and Deluxe engine, while the larger displacement engine has copper-lead alloy for Nos. 1, 2, 3, and 4. End thrust is taken on the rear bearing.

Connecting rods are drop-forged of high manganese steel, of I-beam cross-section, light in weight due to their short length. Big end bearings are of interchangeable type, steel-backed, lined with lead-babbitt alloy. Lubrication for the cylinder wall and piston pin is provided by a metered spray from a drilled hole in the lower end of the rod.

Pistons are of aluminum alloy, with cam-ground slipper skirts, and provided with steel struts to control expansion. They are surface treated and tin-plated, weight being held to 14/100 oz. Three piston rings are used above the piston pin, two compression rings and one special type oil ring. The upper ring is chromium-plated.

Aiming at full breathing capacity for maximum volumetric efficiency, the intake manifold incorporates carefully calculated passages to provide for uniform distribution and a minimum of restriction. Individual passages for each cylinder are of equal cross-section for their full length.

Vertical risers in manifolding for four-barrel carburetors are connected independently to longitudinal passages feeding the branches to the cylinders. The cross-over is achieved by means of over-and-under passages, having smooth contours with liberal radii. During warm-up, exhaust heat from the left bank exhaust manifold is routed through a heat cross-over passage in the intake manifold to heat riser passages surrounding the vertical carburetor risers. A thermostatically controlled butterfly valve at the outlet adapter of the left bank manifold controls exhaust heat admitted to the heat riser.

## EXHAUST SYSTEM ARRANGEMENTS

**E**XHAUST manifolds are three-port iron castings with liberal sized passages. On Clipper Super and Deluxe, and the Clipper Custom line, a single exhaust system is located on the right side of the frame side rail. A cross-over tube under the front end of the engine connects the left bank with the common exhaust pipe on the right side. Packard, on the other hand, has a dual exhaust system comprising individual exhaust pipe, muffler, resonator, and tail pipe on each bank. The tail pipe in this in-

(Turn to page 108, please)



The 1955 Hudson Wasp four-door sedan

## Hudson for 1955 Offers Wide Choice of Power Plants

**H**UDSON cars for 1955 feature complete restyling and a wide choice of power plants. For the first time, three engine options will be offered in the Hornet series. These are: the L-head Championship six; the same engine with Twin H-Power; and a new V-8 which develops 208 hp at 4200 rpm. Its bore is 3 13/16 in., stroke 3 1/2 in., and displacement 320 cu in. The engine has a compression ratio of 7.8 to 1. A double throat carburetor is used. Wasp models will be powered by Hudson's new Hi-Torque six-cylinder engine.

The L-head Championship six with Twin H-Power develops 170 hp at 4000 rpm. It has a bore of 3 13/16 in., stroke of 4 1/2 in., and piston displacement of 308 cu in. Compression ratio is 7 1/2 to 1 and an aluminum cylinder head is standard equipment. The same six engine (available without Twin H-Power) also features an aluminum head as standard equipment. A single carburetor permits 160 hp at 3800 rpm.

Compression ratio for the six-cylinder Wasp engine is 7.5:1, with a 3 by 4 3/4 in. bore and stroke. Output is 104 bhp at 4000 rpm. With Twin H-Power, the compression is increased to 8.0:1, and horsepower is 114 at 4000 rpm.

The front end treatment of the 1955 Hornets and Wasps is new. The massive grille is of one-piece die-cast construction. Both cars feature wrap-around windshields. A broad chrome moulding encircles the windshield to accentuate its design and proportions. Both front and rear bumpers are of entirely new, full wrap-around design. All Hudsons have single unit body and frame construction.

The Hornet and Wasp series will be offered in four models, including four-door sedans and custom hardtops. Wheelbase of the Hornet is 121 1/4 in.; overall length, 209 1/4 in.; height, 62 1/4 in.; and width, 78 in. The Wasp's wheelbase is 114 1/4 in.; overall length, 202 1/4 in.; width, 78 in.; and height, 61 3/4 in.

Rounding out the Hudson line for 1955 are the Rambler and Metropolitan series. Rambler models include a two-door Suburban station wagon, Country Club hardtop, and Club sedan in the 100-in. wheelbase series, and a four-door sedan and Cross Country station wagon in the 108-in. wheelbase series. The Metropolitan is available in two models, hardtops and convertibles.

All Hudson Wasps and Hornet six models will offer a choice of three transmissions — standard synchromesh, overdrive or dual-range Hydra-Matic. The 1955 Hydra-Matic transmissions incorporate a revised valving system for smoother operation.

Power brakes, power steering, power-lift windows are available on Hornet and Wasp models this year. Rambler model options include automatic overdrive and a fully automatic transmission.

Tubeless tires are standard equipment on all models except on the Metropolitan.

American Motors' air conditioning system, which combines refrigerating, heating, and ventilating in one integrated unit, is available on all Hudson models in 1955. All components of the air conditioning unit are located forward of the instrument panel and under the hood.

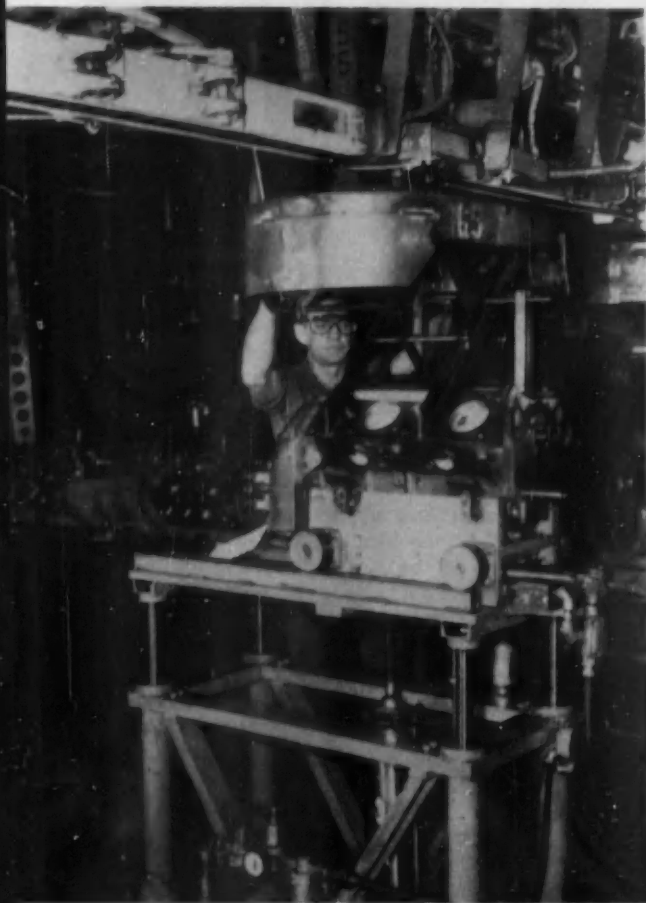


# Various Types of Automation Combined at Pontiac V-8 Engine Plant

**A**UTOMATION in all its characteristic forms—automatic loading and unloading of machines; automatic gaging; automatic transfer through machine lines; and automatic feeding of parts to first operation machines—is a distinctive feature of the new Pontiac V-8 engine plant. Since it is one of the latest plants to be placed in operation, it necessarily embodies the best features known to the art, stemming from accumulated experience.

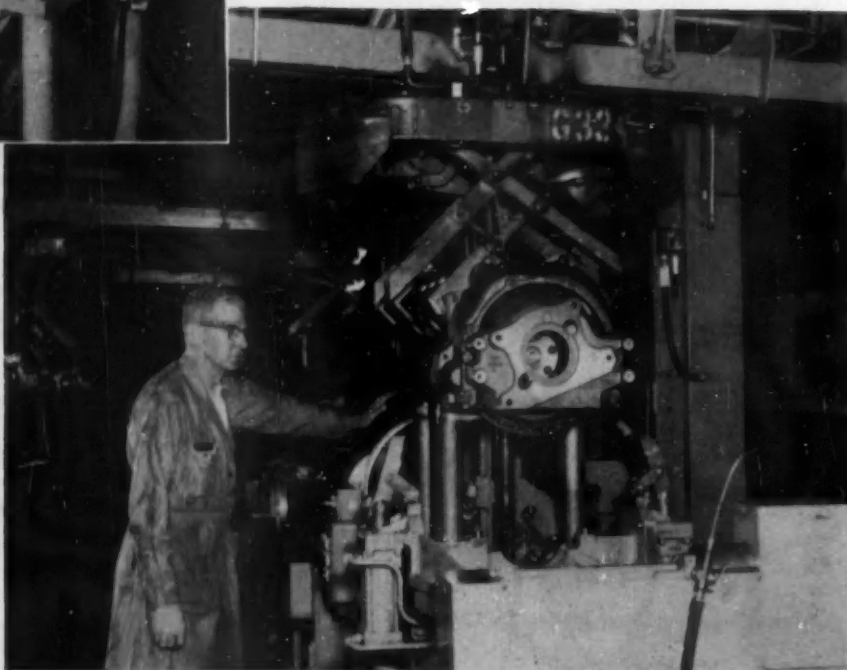
Besides the automation features associated with the many machining operations on the multiplicity of engine components, Pontiac has organized an extensive system of power-and-free conveyors to integrate the functions of engine assembly, engine balancing, engine testing, delivery to storage, and distribution to the final assembly line at Pontiac, as well as shipment to seven B-O-P plants in the U.S.A.

Presented here is a group of illustrations showing a few key points in the complex of Jervis B. Webb power-and-free conveyor lines. They are part of a large group of conveyors arranged primarily to serve as feeder lines for the various sections of the final engine assembly. These individual conveyor lines pick up the individual components—cylinder blocks, crank-



End of the initial stage of engine assembly, producing the basic sub-assembly complete with rotating and reciprocating parts. At this point engines are taken off the line, transferred to the power-and-free conveyor system for routing to the Gisholt Dynetric balancers

This view shows the basic engine sub-assembly ready for installation in the cradle of the Gisholt Dynetric balancing machine. Balancing is effected by drilling large diameter holes in the counterweights of the crankshaft at both ends





shafts, camshafts, cylinder heads, sheet metal parts, etc.—from the final inspection station or machine in each instance and deliver them to the point of assembly on a section of the final assembly line.

As this point is found the integrated and coordinated network of Webb power-and-free conveyors serving the engine balancing equipment, "hot" test stands, delivery to storage, scheduling for shipment and final car assembly at Pontiac.

Even so the setup is quite elaborate, at least from the standpoint of rationalization. The first stage of engine assembly occurs on an independent conveyor line arranged to produce what may be termed the major sub-assembly. It consists essentially of the cylinder block component, along with crankshaft, camshaft, piston and connecting rod assemblies — the major rotating and reciprocating elements assembled in the backbone. The purpose of this sub-division of assembly is to permit final dynamic balancing of rotating and reciprocating parts after all of the possible weight and balance variations have been stacked up.

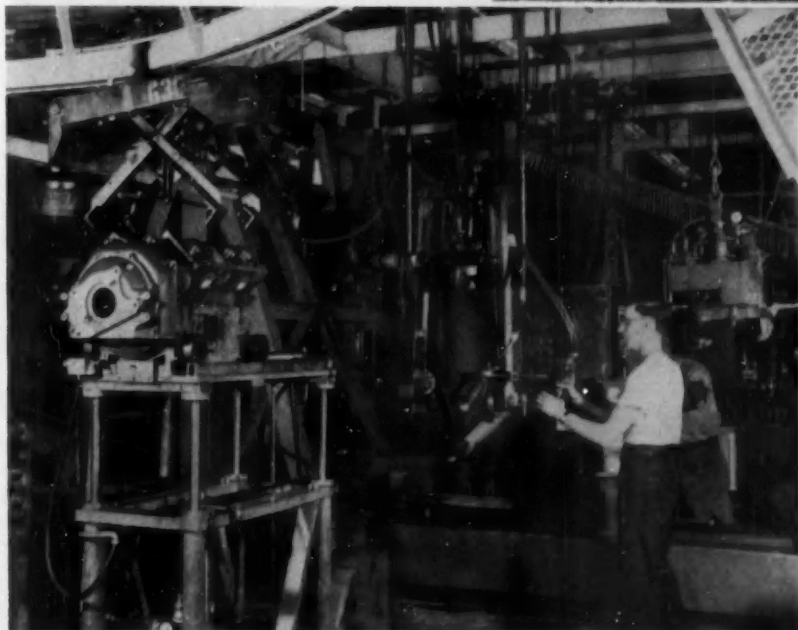
At the end of the line, the sub-assembly is attached to a carrier on the J. B. Webb power-and-free conveyor line, transported to the battery of unique Gisholt Dynetric balancing machines for final dynamic balance. The carriers, scheduled automatically into a balancing machine, as the station becomes free, are installed in place and operated at a standard crankshaft speed to check balance at both ends. It may be noted that when crankshafts are balanced initially in

Gisholt Dynetric balancers in the crankshaft department, they are made deliberately out of balance to provide for final corrective balance in the engine.

This procedure permits the use of large diameter drills at final balancing—one at the front counterweight, the other at the rear. Final balance is held to a tolerance of  $\frac{1}{2}$ -oz in.

Upon completion of the balancing operation, the sub-assembly is returned to the power-and-free conveyor and consigned for transportation to the next phase of final engine assembly in the adjacent bay. The balanced sub-assemblies proceed to this line and are transferred automatically to the assembly conveyor.

At the end of the assembly line engines are hooked



*In the maze of power-and-free conveyor lines that make up Pontiac automation, this is one branch used for transporting fly-wheel housings to the engine assembly line*

*After balancing, the sub-assembly is transported by automation to the start of the final assembly line at the point seen here. The engine is freed from its carrier and dropped onto the assembly conveyor for final operations. Overhead, in the background at the right, may be seen the ingenious chute arrangement, carrying valves from the valve department at the left, directly to the point of assembly in cylinder heads*

into the power conveyor for transport through water-wash spray booths for painting. Following this, they continue to the final dress-up line for fitting with

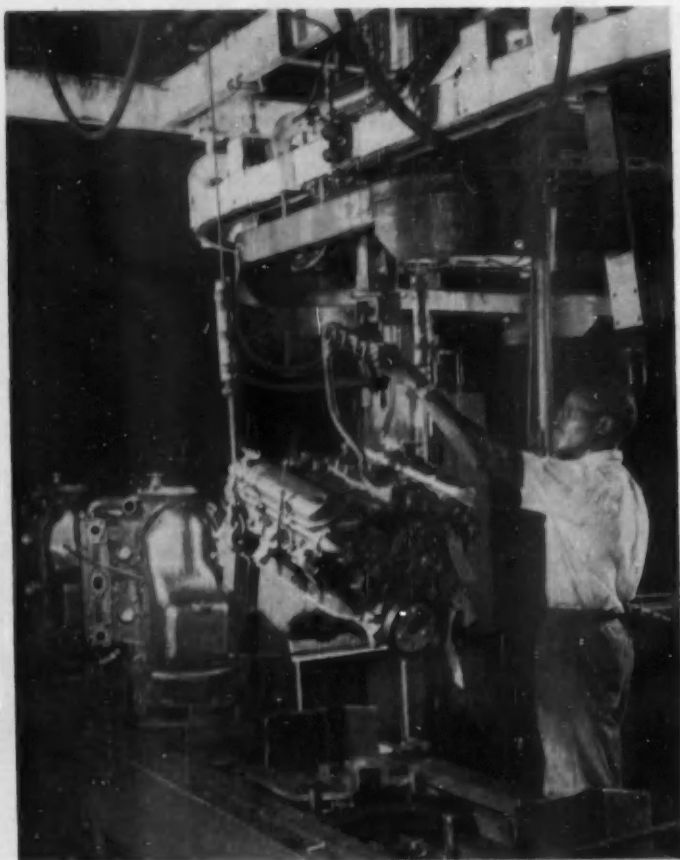
accessories, wiring harness, etc., in readiness for "hot" testing.

Pontiac's "hot" testing differs radically from the arrangement of fixed rows of test stands characteristic of the several new engine plants placed in operation during the past few years. Instead, Pontiac has two enormous merry-go-round turntables, each one provided with 23 test stands. With this arrangement the loading and unloading of engines is handled at one station, traffic being controlled automatically.

The test cycle, essentially one revolution of the turntable, takes about 15 minutes. As an engine approaches the unloading station, the operator disconnects it and has it ready to move out of the system. Similarly, as a free test stand approaches the loading station, an operator stands ready to shift the first engine on the power line to "free" position and drop it into the test stand.

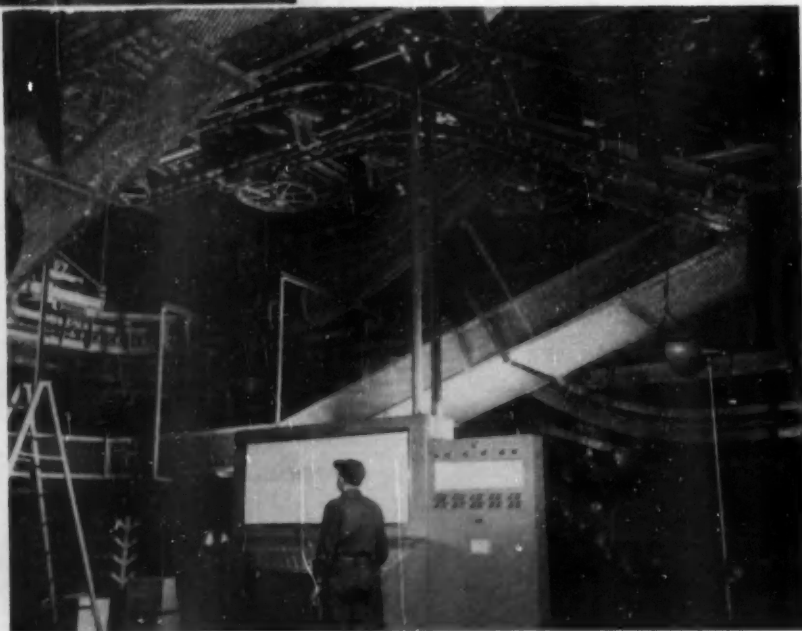
At the end of the test run engines are routed to one of two courses—to the storage banks, if accepted, or to engine repair if faults are found on the test stand. In the latter event, the engines proceed on a by-pass conveyor line to the adjacent repair area for correction. After corrections have been made, the engines are stored in a special bank from which they are drawn for rerouting to the test stands.

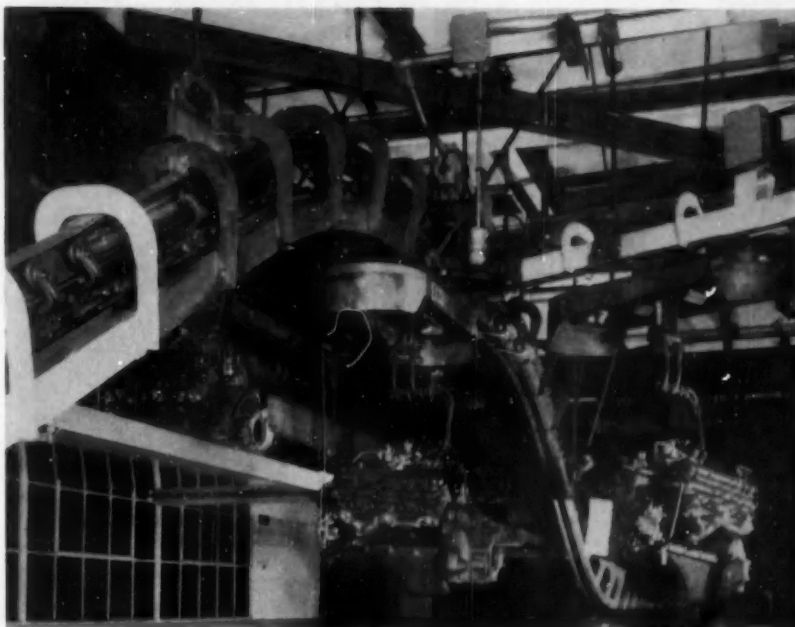
Accepted engines, consigned to stor-



End of the final assembly line. At this point the engine is hoisted from its position on the conveyor fixture, raised to engage a carrier on the power-and-free conveyor for transport to the paint department

View in engine storage section where all incoming engines are routed to storage ahead of shipping, on overhead and ceiling level conveyor lines. The entire control of the power-and-free system through assembly and into storage is handled through the master control cabinet in the foreground. The vertical board contains the layout of all associated conveyor lines





**Complete engines in the storage area. One of the conveyor lines in this maze transports engines for assembly in Pontiac, from the storage bay to the final assembly line in the adjacent building**

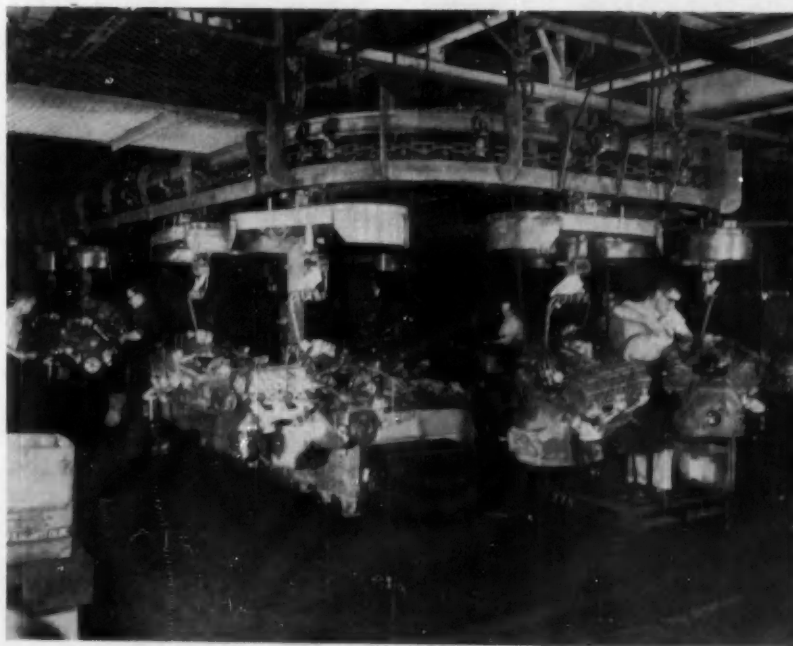
age and delivery, enter an extensive maze of storage conveyors at ceiling level and at high level, capable of holding 1250 engines at one time. At this point there is a major problem of sorting engines to facilitate proper scheduling for delivery. Although Pontiac has but one basic engine this year, there

are a number of variations stemming from customers' options. For one thing, engines for use with either Hydra-Matic drive or synchromesh transmissions have differing compression ratios as well as flywheel housings. In addition, engines must be specially equipped for use with power steering or air

conditioning or both. These variations, however, are handled easily in stride simply by selecting the proper position of the control panel on each carrier.

Up to this point the entire sequence of events from the test stands to storage has been under control from a master control panel in the storage area. However, the scheduling of engines for delivery to final car assembly at Pontiac as well as the filling of orders for shipment to B-O-P plants is handled as a separate function. This is effected from a smaller control panel, dealing entirely with the storage lines.

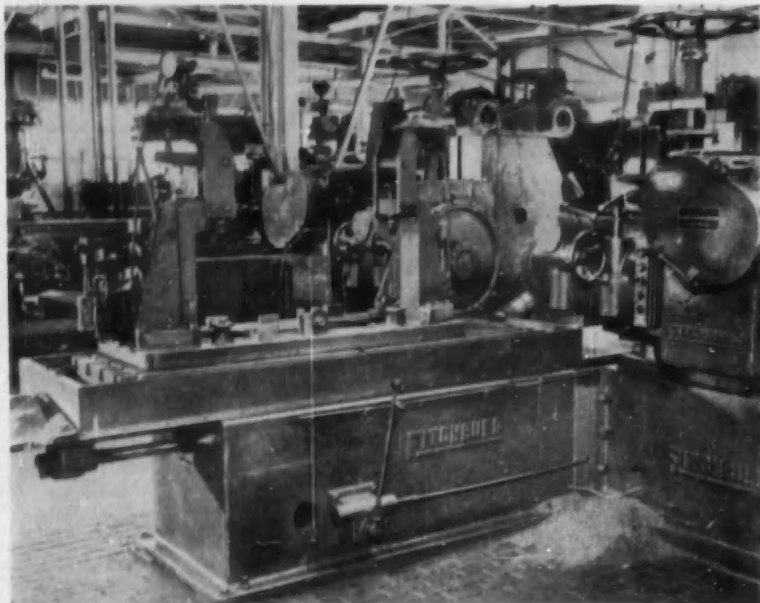
Engines for the local final car assembly line are transferred to a power line running from storage to the adjacent building. They are delivered first to a storage bank, then drawn out according to schedule for fitting with the special accessories for a given order, and assembled with the specified transmission. At this point engines are ready for transport to the assembly line.



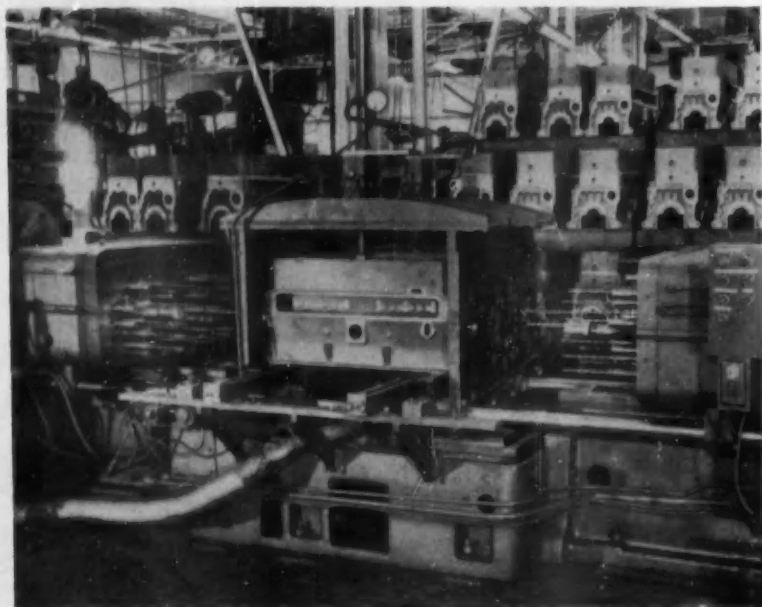
**When engines enter the assembly building, they are routed first to a storage bay, then scheduled out to the "dress-up" line seen here. It will be noted that installation of accessories and wiring harness is done with engines still on their carriers. They then proceed according to schedule down to the final assembly line for installation in the chassis**

# General Purpose Tools Efficient for Variety of Cylinder Blocks

By Thomas Mac New



Four and six cylinder blocks of three different designs are milled on this Fitchburg unit.



First drilling operations are carried out on this Barnes machine which is equipped with heads designed and built by Schramm.

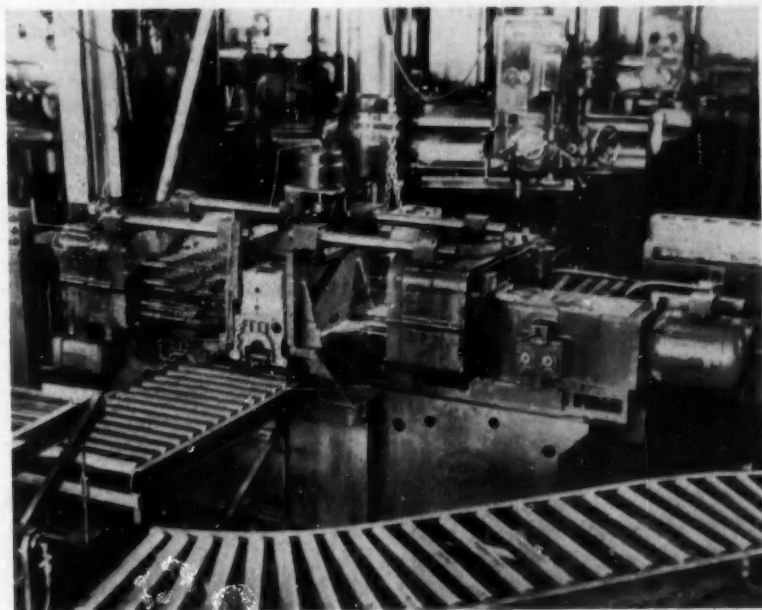
**B**ECAUSE of its high variety and correspondingly relatively low production, Schramm, Inc., West Chester, Pa., makes efficient use of general purpose machine tools with tooling, jigs, and fixtures of its own design. All of the machines throughout the plant can be readily adapted to meet the production requirement of each model block for its Pneumatractors and air compressors which are made in three models—either a complete engine, a complete air compressor, or half engine and half compressor. Two different engine blocks are processed along one production line that is keyed to special jigs, fixtures, and tooling to handle four and six cylinder designs.

The first operations on the rough blocks is performed on a Fitchburg double-head milling machine. As shown in one of the accompanying illustrations, a special fixture is used which locates the block for milling the top, bottom, and bearing locks. Note the large and small milling cutters mounted on a common spindle. The work is located by means of the targets and clamped by air-actuated toggles. A 12-in. milling cutter running at 76 rpm machines the top surface of the block while the bottom is milled with a 21-in. cutter traveling at 36 rpm. All three milling cutters are equipped with carbide bits. Rough and finish cuts are taken with a table feed of four ipm for the rough cut and 7.7 ipm





**A Super Service radial is used for drilling all odd holes. Note the roll-over fixture.**



**Using hydraulically-actuated heads—guided by pilot bars, a Baker duplex machine drills 88 holes in the sides of the block.**

for the finish cut. In addition to the milling operation, the operator has been supplied with a Keller air-feed drill with a two-step bit for machining two dowel holes in the oil pan flange that are used for locating the block in subsequent operations.

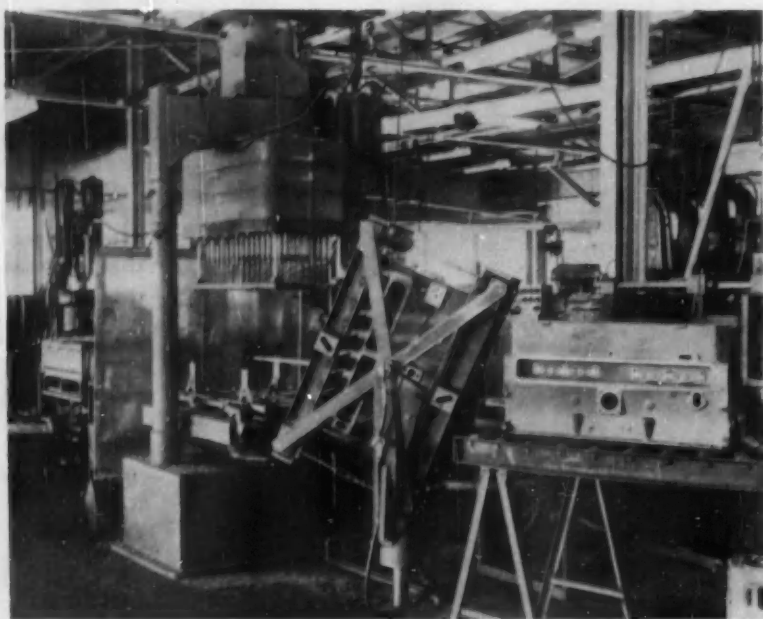
The same Fitchburg machine is utilized for milling the ends and sides of the block. In both cases, the block is located by the dowel holes. For these operations, of course, the tooling and fixtures are changed. Floor-to-floor time is 12 minutes for the ends and 15

minutes required for the sides.

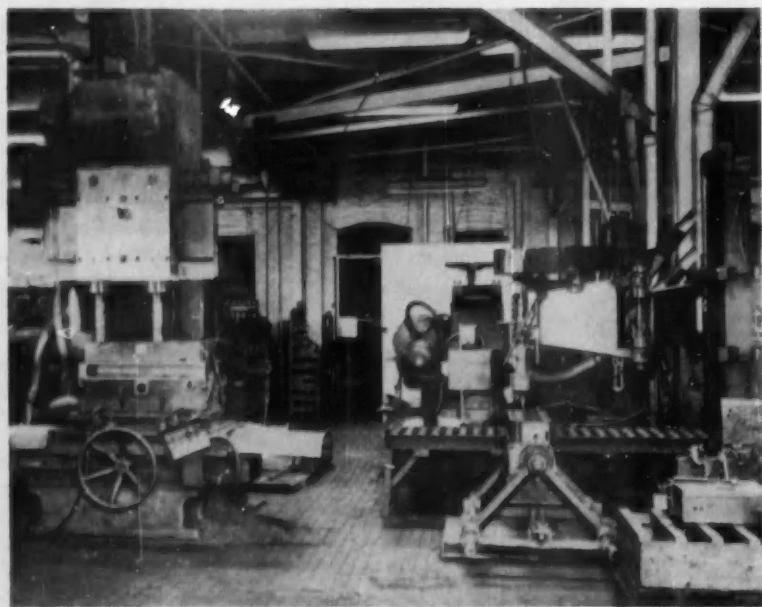
Following the milling, both ends of the block are drilled in a Barnes Duplex equipped with heads designed and built by Schramm. The machine is a two station hydraulically operated transfer type. It is equipped with a special drill jig to handle all six types of blocks. Air actuated toggles are used to secure the workpiece in position. Schramm makes use of the drill heads—which are fed hydraulically and kept in line by pilot bars—on three other machines for various drilling and boring work on the block. On the Barnes unit the heads are used to drill and counterbore 30 holes in each end of the block at one pass. Drills range in length from 22 to 37 in. and size from a No. 7 to a 2 $\frac{5}{8}$  in. counterbore, dependent on the block. The counterbore tool uses Carboly 883 bits and has a special shank for insertion in a drill chuck. Both heads feed in at five ipm with drill speeds varying from 618 rpm to 803 rpm. The counterbore's speed is 475 rpm. A total of 15 minutes is required for the entire operation—floor to floor. Schramm engineers state that the same set of tools has been used for two years' production in this setup with just periodic touching up.

The next operation is one of the longest—a floor-to-floor time of 90 minutes—since at this point several drilling operations are carried out on all of the odd holes as well as the angular oil holes, plus stud holes for bearing caps. A Super Service radial drill is used in conjunction with a unique air operated roll-over fixture and drill jig. An air motor is utilized to turn the flange of the fixture to six indexes. A quick-change tool holder has been fitted in the head of the machine with the tool board conveniently located next to the drill. The block is first hoisted to a small roller conveyor and hand pushed into the roll-over fixture.

After leaving the radial drilling operation, the block is hoisted to a roller conveyor which leads through a Baker duplex drilling machine equipped with Schramm heads. At this processing station a total of 88 holes are drilled in the sides of the block.



The unique swiveling turnover fixture pictured in the foreground is used three times during the course of drilling operations carried out by the Schramm designed machine tool.



Boring and tapping operations are performed in these machines.

Engine blocks are manually pushed into position and extracted the same way. Floor to floor time for this operation is 12 minutes. The hydraulically actuated heads—guided by pilot bars—feed  $1\frac{1}{4}$  ipm for the left hand unit and two ipm for the right hand head. Drills in the left hand head run at 160, 577, and 750 rpm while drills in the other head run at 532, 692, and 900 rpm.

Work in process is pushed through the Baker into a short roller conveyor and then positioned in a swivel-

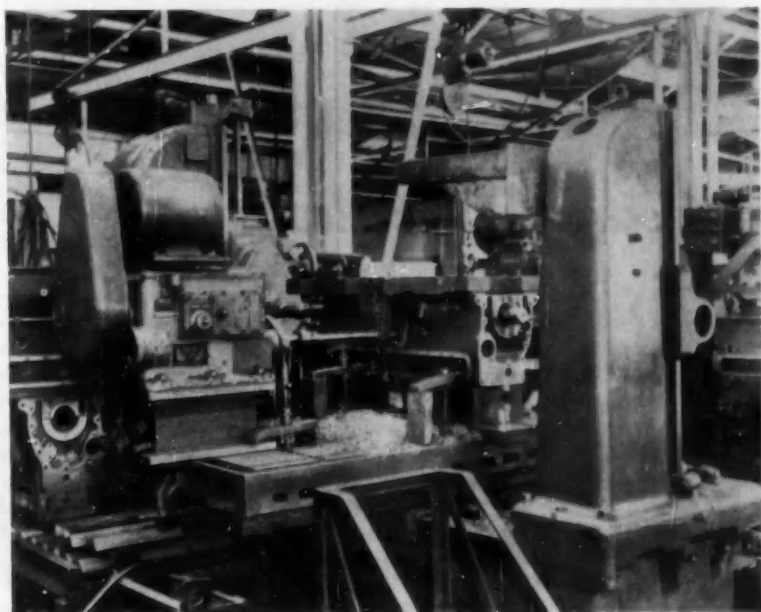
ing turnover fixture. This fixture picks up the block at right angles to the succeeding operation and turns it horizontally 90 deg for insertion into a multiple drill of Schramm design. After drilling the cylinder head stud holes, the block is again pushed into the turnover for 180 deg vertical rotation and inserted back in the multiple drill for machining the oil pan holes. When this step is finished the block is once again placed in the turnover fixture, rotated 180 deg vertically, and pushed onto a roller conveyor. The total floor-to-floor time of the complete operation is but eight minutes. Drills feed into the work at a rate of two ipm and run at 483 and 627 rpm.

After a stop-over for tapping all end holes on a Hammond taper, the block is positioned on the bed of a Moline boring machine. It then goes on to another tapping operation for all holes in the top, sides, and bottom. One operator handles both the tapping and boring steps. For tapping, the block is trunion mounted in a triangular fixture. On the boring phase, a tapered plug, spring loaded, is used for indexing. One fixture is used for four and six cylinder blocks. The Moline machine rough and semi-finishes the cylinder bores, leaving 0.002 in. for honing. Carbide equipped boring bars rotate at 285 rpm and feed in at 1.52 ipm. Floor-to-floor time for both operations is 90 minutes.

At the next machining phase the crankshaft bearings are faced after the caps have been installed. A universal machine using a fly-bar is utilized for the operation. The bar is hand

fed and runs at 63 rpm. At this same station, a separate head driving a boring bar at 400 rpm and feeding it at 2.28 ipm finishes the oil pump hole. These operations require a floor-to-floor time of 20 minutes.

A two-station Natco machine is then used to rough and finish the camshaft and crankshaft bores, taking a total time of 15 minutes. All boring bars run at 148 rpm and feed at 0.81 ipm. Upon leaving this processing point, the end of the block is ground perpendicular to the crank bore. Grinding is done by a 12 in. diam



*A hand-fed flybar running at 63 rpm is utilized to face the main bearings. The oil pump hole is bored at this station.*

*After leaving a Natco boring machine, the end of the block is ground perpendicular to the crank bore by the equipment on the right, below.*

wheel turning at 1800 rpm. Other miscellaneous operations, such as finishing the valve ports and honing, are then performed to complete the workpiece.

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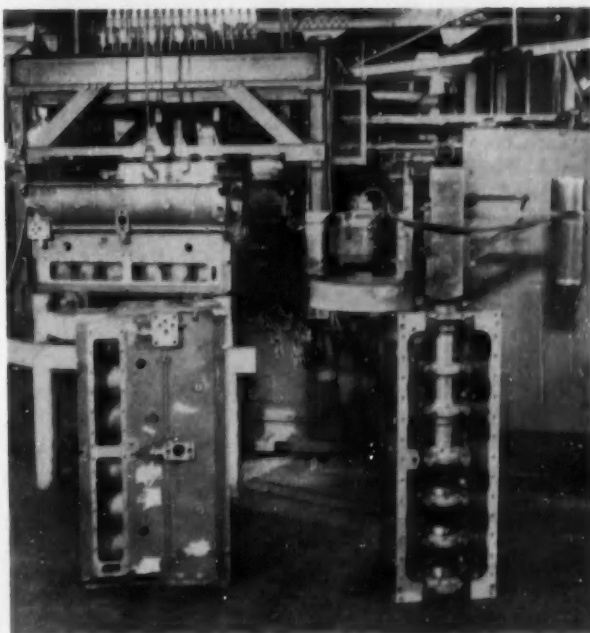
## Progress on Smog Problem Reported by C. A. Chayne

The automobile industry, which has been studying the smog problem in Los Angeles and has intensified its work in the last year, is testing several devices that reduce hydrocarbons in exhaust gases. These devices, however, are not located in the exhaust systems of vehicles.

A recent talk by Charles A. Chayne, chairman of the Automobile Manufacturers Association's Engineering Advisory Committee, before a meeting of the technical conference of the Air Pollution Control Association, indicated that much attention probably will be focused on this subject at the January meeting of the Society of Automotive Engineers. He pointed out that new engines and automatic transmissions have done much to improve combustion, which has resulted in the reduction of unburned hydrocarbons in exhaust gases.

There is a possibility that the new devices being tested may cut emission of hydrocarbons up to 50 per cent. However, Mr. Chayne stated, these units must still be developed into practical form and put into commercial production.

The speaker did not dispel the theory in some quarters that automobiles might contribute to cre-



ating smog. He mentioned that AMA has taken samples of matter from Los Angeles smog and, by means of radioactive dating techniques, expects to determine to what extent petroleum sources are responsible.

Last May, AMA granted \$50,000 to the Southern California Air Pollution Foundation to study the air pollution problem further. Latest studies have indicated that smog is the result of a number of complicated factors which interact upon one another.

# Supersonic Aircraft and Automation

## Important Subjects at ASME Meeting

**D**ESIGNING machinery for automation, and designing aircraft to live with thermal heating at supersonic speeds, were two of the important subjects explored at the 1954 Annual Meeting of the American Society of Mechanical Engineers in New York City last month. Attendance of over 8000 engineers and executives was recorded at the 124 technical sessions, involving 350 papers.

Eleven co-operating societies joining with the ASME included: American Institute of Electrical Engineers, American Rocket Society, American Society of Lubricating Engineers, American Society for Testing Materials, Institute of Aeronautical Sciences, Instrument Society of America, National Security Industrial Association, Society of Automotive Engineers, Society for Experimental Stress Analysis, Society of Naval Architects and Marine Engineers, and the Transport Air Group.

David W. R. Morgan, vice-president of Westinghouse Electric Corp., was elected president of the ASME for 1955.

### Thermal Barriers to Flight

Nine papers on thermal flight problems covered the effects of supersonic flight on aircraft, equipment, and man.

The term thermal barrier was devised to describe the heating effect of air on the skin of high speed aircraft. There is, of course, no actual barrier beyond which the effect decreases. This friction heat is due to the acceleration of still air to the speed of the air-

craft in a very short distance, particularly at speeds above Mach 2 or twice the speed of sound. There was agreement at the various sessions that aircraft will be designed to fly cool at high speeds, rather than to endure the high temperatures.

Some general effects of the thermal barrier were outlined by C. H. McLellan, of the National Advisory Committee for Aeronautics. Figure 1 shows the initial velocities and Mach numbers that are required for various flight ranges, using a ballistic trajectory.  $T_s$ , the stagnation temperature is the temperature of still air just ahead of a blunt-nosed vehicle at various speeds. These temperatures are, of course reached only in the high-density air near the earth's surface, on the return of the vehicle when its speed is actually high near the earth.

Mr. McLellan gave test data on wind-tunnel tests of melting a body by aerodynamic heating. The tests were made on a model of Wood's metal at Mach 6.9. These tests showed that some aspects of the melting problem can be studied using low melting temperature materials. Several ways of dealing with thermal heating were suggested by Mr. McLellan, including using reverse thrust to decelerate a vehicle before it re-enters high-density air, using a large drag-to-weight ratio, using insulation, using transpiration cooling, or allowing parts of the vehicle to melt.

Effects of changes in metals at elevated tempera-

Fig. 1

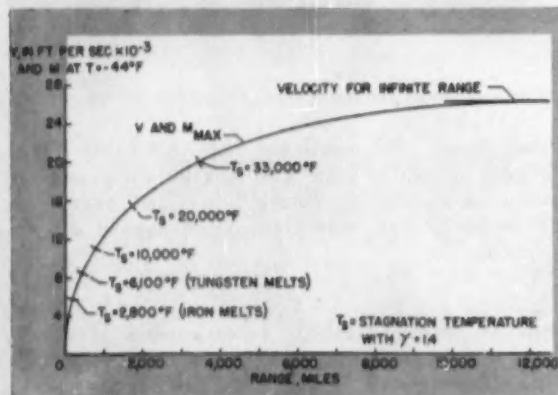
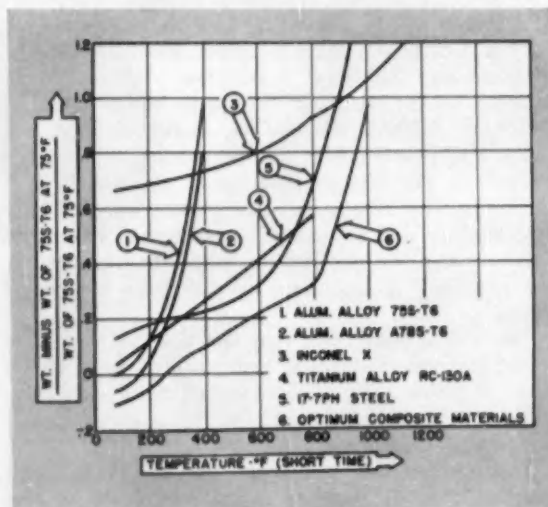


Fig. 2





tures were shown to influence structural design in various ways. From the paper by F. R. Steinbacher and Louis Young of Lockheed Aircraft Corp., Fig. 2, shows the weights of materials required as temperature increases, and a composite using the best material for each type of loading. The weights are shown as a ratio of each material to 75S-T6 aluminum alloy at a temperature of 75 F. Concerning insulation, the authors showed Fig. 3 to indicate the weight of insulation and Fig. 4 the weight of refrigeration needed for a specific condition of maintaining a square foot of surface cooled to below 200 F at 40,000 ft. They concluded that creep will be a major problem, and that unless research is increased, structural design will fall five to 10 years behind aerodynamics and propulsion.

Cooling systems were outlined by H. W. Adams of Douglas Aircraft Co. After pointing out that temperature rise varies with Mach number and not altitude, he showed that heat input into an airplane at 120,000 ft is only one per cent of that at sea level. Figure 5 depicts the performance of a hypothetical high-speed aircraft at three wing loadings. Figure 6 summarizes the best cooling systems, from a horsepower standpoint, for altitudes of 70,000 ft (the author gave design details of several types). Below Mach 2, the best air-cycle system is the ram turbine and blower. Above Mach 2, the compound ram turbine and blower system is better. On this basis, the water evaporator and fuel-heat-exchanger systems are equal, and better than air-cycle systems above Mach 1.

Representative chemical and nuclear-fueled aircraft design summaries from the author's studies are shown in Figs. 7 and 8, for aircraft with insulation equal to one in. of fiber glass. Without insulation, cooling

Fig. 3

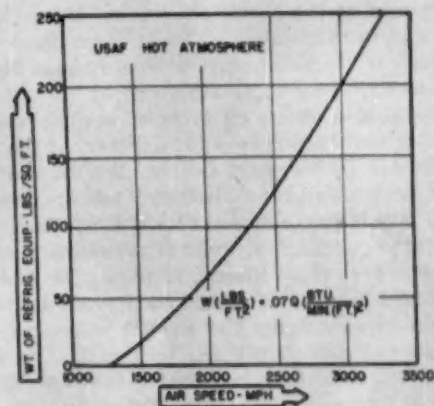
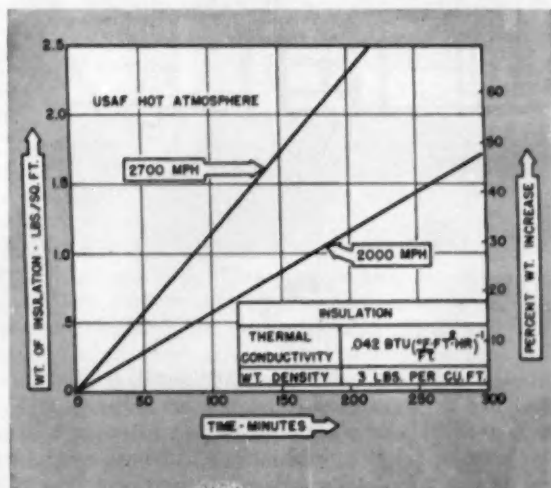


Fig. 4



GROSS WEIGHT = 25,000 LB.  
FUEL WEIGHT = 12,500 LB.

TOTAL WETTED AREA:

917 SQ. FT. FOR WING LOADING = 1000 LB/SQ FT  
988 SQ. FT. FOR WING LOADING = 330 LB/SQ FT  
1231 SQ. FT. FOR WING LOADING = 100 LB/SQ FT

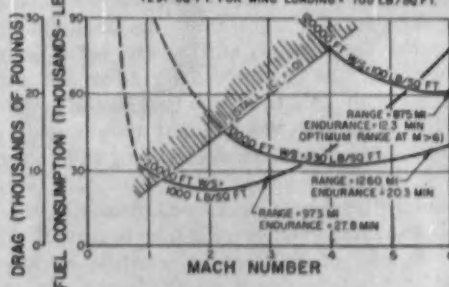


Fig. 5

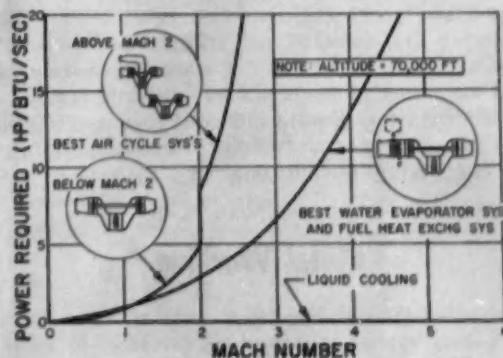


Fig. 6

horsepower of the chemically fueled aircraft would be raised to 25 per cent of flight hp at Mach 3.5. In the nuclear fueled aircraft it would equal flight hp at Mach 4.9, using water evaporation.

Temperature effects on turbojet engines were discussed in some detail by A. J. Gardner, of the USAF Wright Air Development Center. His data indicated that typical compressor-discharge temperatures over 35,000 ft will range from 600-800 F at Mach 1.2, to 1000-1200 F at Mach 3. Inlet temperature rises from 60 to 650 F at these speeds. However, the turbine is the critical item. With a fixed maximum inlet temperature, a turbine limits the amount of energy which the fuel can add to the gas upstream. The author showed the reduction in effective compression ratio across the compressor as a result of heating at the inlet, and discussed the advantages and disadvantages of this fact. Practical temperature ranges to be expected at higher flight speeds are shown in Fig. 9 for a typical engine.

Additional power system problems, according to R. B. Keusch, also of USAF-WADC, include vaporization of fuel, oil cooling, strength of lines and fittings, method of driving accessories, induction of air, and cooling systems. He discussed the work being done by various groups on these problems.

Artificial heat sinks will be required, according to J. Makowski and V. L. Whitney, Jr., of Fairchild Engine & Airplane Corp., to cool the crew and equipment. The authors depreciated the possibility of reducing the temperature of ram air, or of using the airframe and fuel as sinks. They advocated water as a sink, as being able to absorb heat at the proper temperature level, with the smallest weight and volume penalty. Several systems were shown and the components analyzed.

Structural problems such as thermal stresses, thermal buckling and creep were shown to depend on time, by N. J. Hoff of Polytechnic Institute of Brooklyn. Transient conditions will be the designer's criteria for supersonic aircraft, he said. Minimum weight, said George Gerard of New York University, is determined from analytical methods for web, post, Y-stringer panel and sandwich construction. Then materials are evaluated, and relative weights for two similar aircraft are estimated when designed for normal and elevated temperatures. Growth factors are considered later. Gerard indicated that weight penalties may limit sustained flight to conditions in which the temperature remains under 800 F.

## Metal Working

Results of score resistance tests of 38 metals in high-speed contact with steel are presented in Table 1. A. E. Roach, C. L. Goodzeit, and R. P. Hunnicutt of General Motors Research Laboratories Div., said in their paper that the metals germanium, silver, cad-

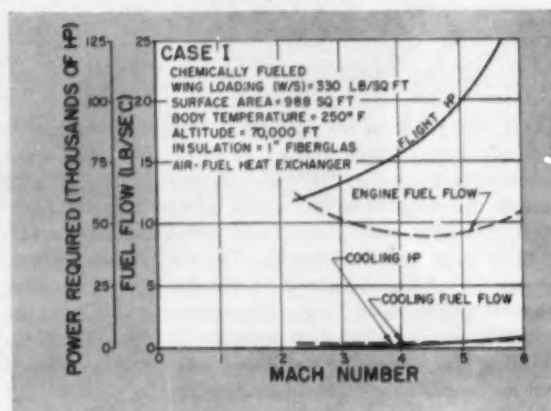


Fig. 7

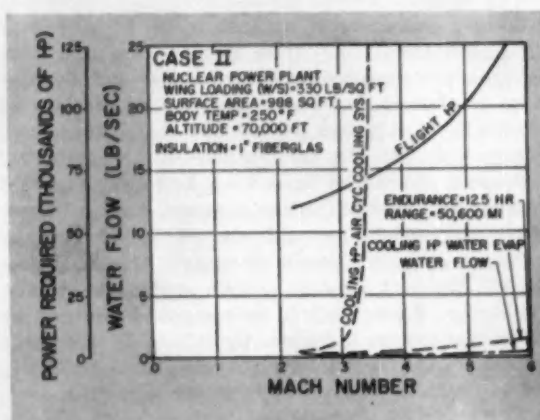


Fig. 8

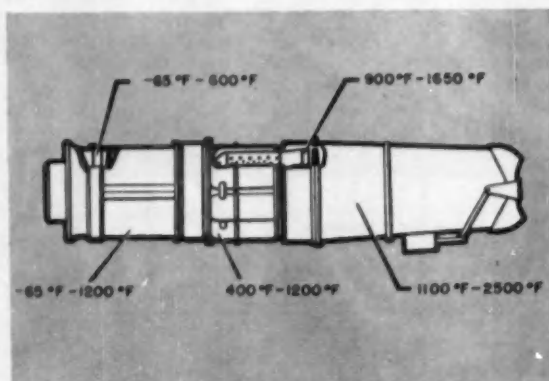


Fig. 9

mium, indium, tin, antimony, thallium, lead and bismuth had the best score resistance, or ability to slide without welding or otherwise sticking together. This group rated "good" by passing a 1280-psi constant load test. Three other groups of decreasing ability

Good	Fair	Poor	Very Poor
Germanium	Carbon	Magnesium	Beryllium
Silver	Copper	Aluminum	Silicon
Cadmium	Selenium	Copper	Calcium
Indium	Cadmium	Zinc	Titanium
Tin	Tellurium	Barium	Chromium
Antimony		Tungsten	Iron
Thallium			Cobalt
Lead			Nickel
Bismuth			Zirconium
			Columbium
			Molybdenum
			Rhodium
			Palladium
			Cerium
			Tantalum
			Iridium
			Platinum
			Gold
			Thorium
			Uranium

TABLE I

were: "fair," failed 1280 psi for one minute; "poor," failed 768 psi for one minute; "very poor," failed zero to 768 psi increasing uniformly at 4.35 lb per second. The authors gave a detailed account of the tests and a correlation of score resistance with other properties of metals. They speculated that metals immiscible with iron must also have B-subgroup characteristics of co-valence and hence a brittle molecular bond, in order to keep from scoring steel.

In another paper the same authors reported tests of the functional characteristics and surface damage of 39 metals in sliding contact with iron. Table II summarizes the results. In test I the normal load was 0.6 lb. In test II the normal load was proportional to the indentation hardness of the plate-specimen. This varied from 0.1 lb for indium to 1.0 lb for all elements as hard as the Armco iron rider (the standard). Table III classified the plate-specimens by the type of surface damage they suffered. Type 1P is well defined but discontinuous; 2P is well defined and continuous; 3P is poorly defined; 4P is similar but more asperities are still intact and welds more prominent. Table IV classifies the Armco iron rider according to surface damage suffered. Type 1R has contact area poorly defined; 2R is well defined with evidence of plate metal; 3R is more so with evidence of removal of rider metal; 4R original asperities are leveled off and displaced, with no plate metal welded on.

Calling for standards to specify surface finish, L. Chaney and C. H. Good of Micrometrical Mfg. Co. offered an approach. They suggested a correlation of finish and performance, by the same method as was used on standard fits. Much unpublished data should be available, they said, and a canvass of industry would be fruitful. They also indicated the importance of roughness width cut-off specifications. Some data were developed to show that a wide spacing cut-off difference of 20 per cent could make a difference of 100 per cent in the roughness reading.

## Production

Ultrasonic 100 per cent testing of aircraft parts still calls for statistical quality-control methods, according to D. F. Flanders of Allison Div., General Motors. The "average and range control chart" method indicates approaching trouble, they explained.

Inspection of incoming steel at the Ternstedt-Detroit plant of General Motors was outlined by D. J. Heinlen of GMC. A quick check of dimension and appearance is made while the steel is still on the truck. A sample size is determined and sheared for laboratory or Rockwell tests. The author described the laboratory and procedures used there. He explained the "tool and die tryout stock program," in which the design engineer's specifications are reviewed by the laboratory.

Testing of various jet engine fuel systems accurately at low cost was explained by W. S. Bobier, of

TABLE II

Element	Test I Coefficient	Test II Coefficient
Beryllium	0.43	0.48
Carbon	0.16	
Magnesium	0.52, 0.48 S	0.48, 0.48 S
	0.35, 0.32 K	0.38, 0.36 K
Aluminum	0.61, 0.64, 0.61	0.65, 0.72, 0.63
Silicon	0.56	0.58, 0.58
Calcium	0.67	0.75
Titanium	0.59, 0.59	0.56
Chromium	0.53	0.54
Manganese	0.57, 0.57	0.54
Iron	0.47, 0.50	0.57, 0.58
Cobalt	0.45, 0.46	0.43
Nickel	0.60, 0.56	0.61
Copper	0.45	0.69
Zinc	0.50	0.52, 0.55
Germanium	0.66	0.66
Selenium	0.43	0.62
Zirconium	0.55	0.66
Columbium	0.58, 0.55	0.55, 0.51
Molybdenum	0.47, 0.48	0.47
Rhodium	0.54	0.46, 0.49
Palladium	0.66	0.72, 0.68
Silver	0.33, 0.32, 0.31	0.33, 0.36
Cadmium	0.67	0.76
Indium	1.28, 1.28	0.67, 0.75
Tin	0.50, 0.28	0.46, 0.19
Antimony	0.25, 0.26, 0.27	0.25, 0.23
Tellurium	0.21, 0.20	0.29, 0.43
Barium	0.89	0.88
Cerium	0.60	0.63
Tantalum	0.66	0.57
Tungsten	0.47	0.48
Iridium	0.51	0.52
Platinum	0.52, 0.60	0.64, 0.74
Gold	0.54	0.57
Thallium	0.68	0.66
Lead	0.82, 0.82 S	0.76, 0.46
	0.53, 0.50 K	
Bismuth	0.67 S	0.64 S
	0.40 K	0.43 K
Thorium	0.82	0.85
Uranium	0.50	0.50

TABLE III

Type 1P	Type 2P	Type 3P	Type 4P
Magnesium	Carbon	Titanium	Beryllium
Selenium	Aluminum	Iron	Silicon
Silver	Calcium	Columbium	Chromium
Tin	Copper	Tantalum	Manganese
Antimony	Zinc	Uranium	Cobalt
Tellurium	Zirconium		Nickel
Gold	Palladium		Germanium
Lead	Cadmium		Molybdenum
Bismuth	Indium		Rhodium
	Barium		Tungsten
	Cerium		Iridium
	Platinum		
	Thallium		
	Thorium		

TABLE IV

Type 1R	Type 2R	Type 3R	Type 4R
Carbon	Magnesium	Titanium	Beryllium
Selenium	Aluminum	Iron	Silicon
Silver	Calcium	Columbium	Chromium
Tin	Copper	Tantalum	Manganese
Antimony	Zinc	Uranium	Cobalt
Tellurium	Zirconium		Nickel
Lead	Palladium		Germanium
	Cadmium		Molybdenum
	Indium		Rhodium
	Barium		Tungsten
	Cerium		Iridium
	Platinum		
	Gold		
	Thallium		
	Bismuth		
	Thorium		

Vickers, Inc. He described the universal test stand, which is both static and dynamic by means of an analog computer engine simulator.

An analytic approach to production scheduling, which is applicable to machine computing, was outlined by M. E. Salvesson of the General Electric Major Appliance Div. The system has been used to "balance" an assembly line of sub-assemblies required in

the optimum order, for various levels of output.

Linear programming as a technique of operations research was described by E. L. Arnoff of Case Institute of Technology. He said it can be used to answer questions regarding such topics as addition of extra shifts, overtime, addition of machine time, changes in price, cost of good-will items, direction of sales effort, and optimum product mix.

### Court Ends Five-Year Suit Against du Pont Interests

Dismissal of a U. S. suit involving du Pont Co., General Motors Corp., and U. S. Rubber Co., has seemingly ended the biggest anti-trust case in history. The case, which all industry has watched closely since it was filed by the Government five years ago, also brought to light some interesting events which led to du Pont's investment in General Motors nearly 40 years ago.

The civil suit, which sought to break up the du Pont empire on the grounds that the Government failed to prove its charge of conspiracy, monopoly, and restraint of trade, was dismissed by the U. S. District Court in Chicago. In the opinion of the court, the Government failed to prove that du Pont interests handpicked the directors of GM; that stock held by du Pont family members in holding companies was for the purpose of perpetuating control; that du Pont's participation in GM management established that it controlled GM; and that du Pont sought to force GM to buy its products or those of U. S. Rubber, in which the Government claimed the du Pont family had voting control.

Du Pont's acquisition of GM stock, the court said, took place over 30 years ago, and in those intervening years, the record disclosed, no restraint of trade has resulted. The events leading up to the du Pont's investment in GM were detailed by Pierre S. du Pont, one-time president of GM.

He recalled that du Pont in 1917 needed an investment in a concern with good earning power and dividends to take the place of the company's dwindling military business, and the most logical company was GM. Du Pont later increased its GM investment to an alleged total of 20 million shares today.

In reference to the formation and operation of Kinetic Chemicals, at one time owned jointly by du Pont and GM, the court said the evidence showed that GM was not bound to surrender its chemical discoveries to du Pont. Nor, on the other hand, did du Pont limit GM's research on synthetic rubber.

### Metal Stamping Industry Undergoes Great Growth

The metal stamping industry has experienced a phenomenal growth in the past 15 years, and there seems to be no end to its future potential. According to the records of the Bureau of Census, the number of establishments primarily engaged in the manufacture of job stampings increased more than 100 per cent from 965 in 1939 to 1981 in 1947.

During the period covered by this series, the number of hourly employees increased 102 per cent, and the wages paid increased over 500 per cent. The average annual wage of the hourly worker showed an increase during this 14-year period of over 200 per cent from \$1223 to \$3835.

The value of products shipped by the industry during this period also increased sharply by more than 2½ times. Value added by manufacturers showed an increase of nearly five times during these years.

One measure of the growth of the industry during this period which was not affected by inflation is the use of metal. From 1939 to 1947, metal consumption increased 288 per cent.

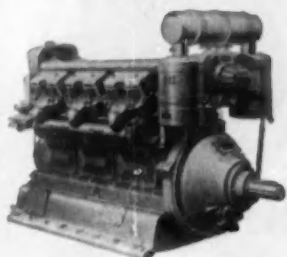
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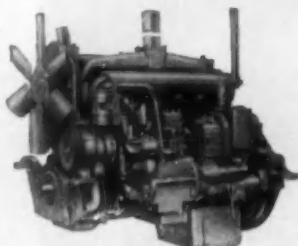
# SOME FAMOUS ENGINES EQUIPPED WITH SCHWITZER-CUMMINS TURBOCHARGERS AND SUPERCHARGERS



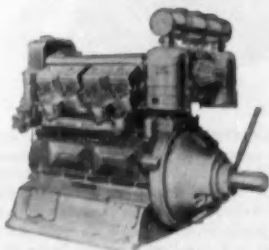
Model 687-C—Harnischfeger Corporation  
6 cylinder, 2 cycle using two S-C  
superchargers.



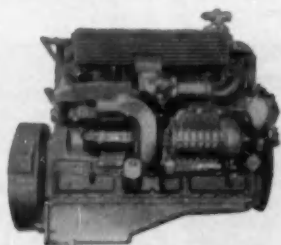
Model D-397—Caterpillar Industrial  
Diesel V-12.



Model D-337—6 cylinder—  
Caterpillar Diesel.



Model D-375—Caterpillar Diesel V8.



Model HRBS-600—Cummins Engine Com-  
pany, Inc. (Used also on HBS Series.)

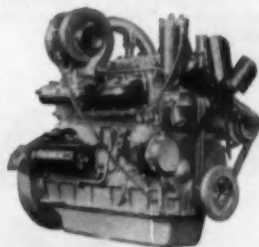
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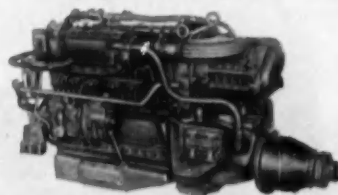
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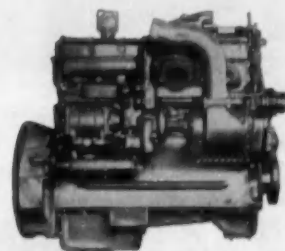
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Model 135-DKBS—Waukesha Motor Company  
with Schwitzer-Cummins Turbocharger.



Model DIX6ES—Hercules Motor Corporation  
Diesel with Schwitzer-Cummins Supercharger.



Model JBS-600—Cummins Engine Company, Inc.  
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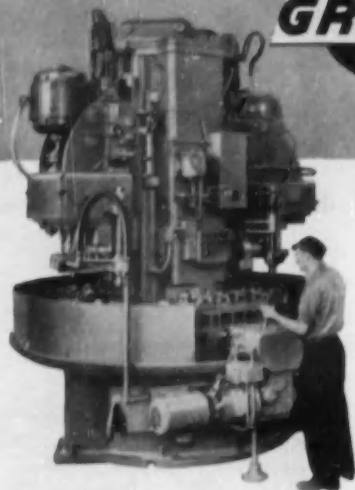
Air Starting Motors and Thermostatically Controlled Fan Drives manufactured for and sold exclusively by the Bendix-Westinghouse Automotive Air Brake Co., Elyria, Ohio.

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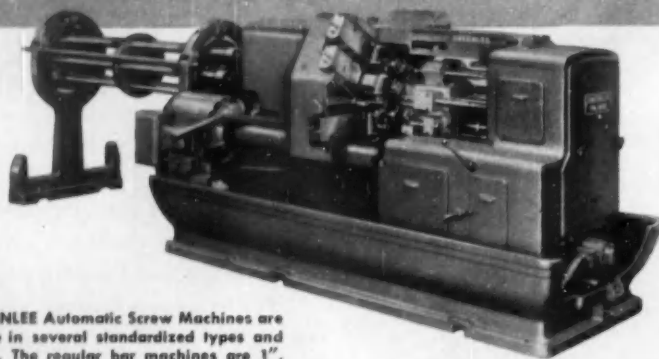
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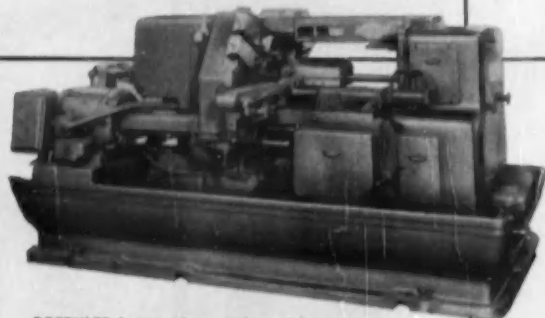
PRODUCTION MACHINERY  
**GREENLEE SPECIAL MACHINES**



This is an example of a Vertical-type Special-purpose Four-station Automatic Indexing Machine designed and built to perform a number of important operations on connecting rods for an automobile engine.



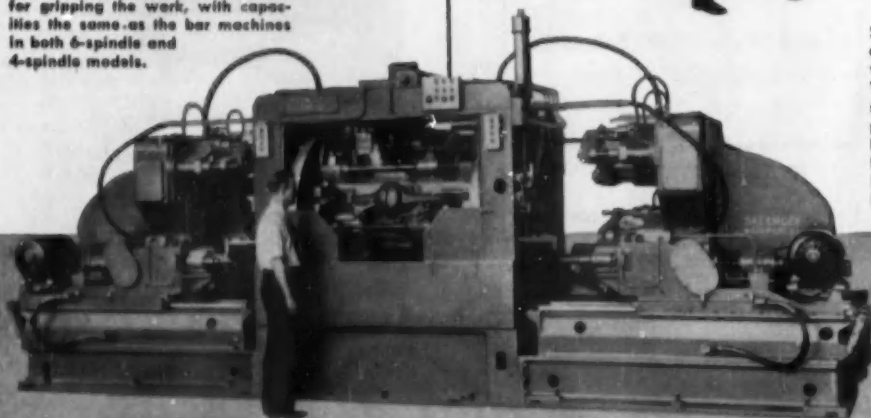
GREENLEE Automatic Screw Machines are made in several standardized types and sizes. The regular bar machines are 1", 1½", and 2" capacities in 6-spindle models, and 1½" and 2½" in the 4-spindle models. GREENLEE Automatics have a number of distinctive features which help to lower costs on both long-run and short-run jobs.



GREENLEE Automatics are also made for second operation work, an example of which is shown here. Collets are used on these machines for gripping the work, with capacities the same as the bar machines in both 6-spindle and 4-spindle models.



Since 1935 GREENLEE has pioneered in the design and manufacture of Automatic Transfer Machines widely used in the big mass-production factories. The example shown here is a comparatively small and compact six-station machine which performs a group of operations on the ends and head faces of a V-8 cylinder block. Some of the bigger GREENLEE Transfer Machines will do several hundred operations in a cycle time of less than half a minute.



At the left is another GREENLEE Special Machine, in this case a Horizontal, Two-way, Four-station, Drilling, Boring, and Tapping Machine for finishing a series of holes in the ends of rear-axle housings. GREENLEE experience is available for the design and manufacture of a wide range of such cost-reducing machines.

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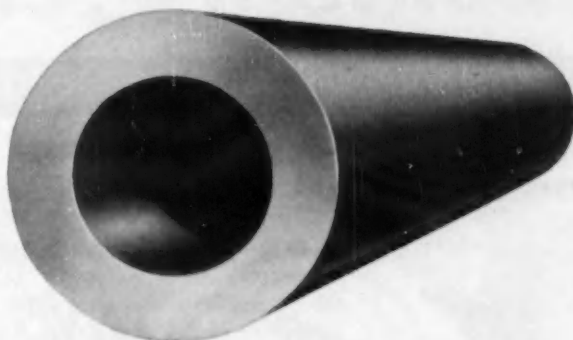
MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES

• AUTOMATIC SCREW MACHINES

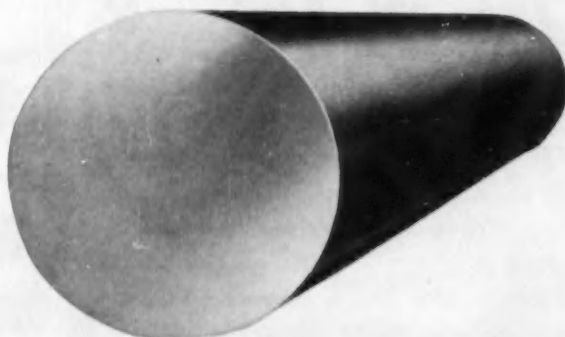
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*AUTOMOTIVE INDUSTRIES, January 1, 1955*

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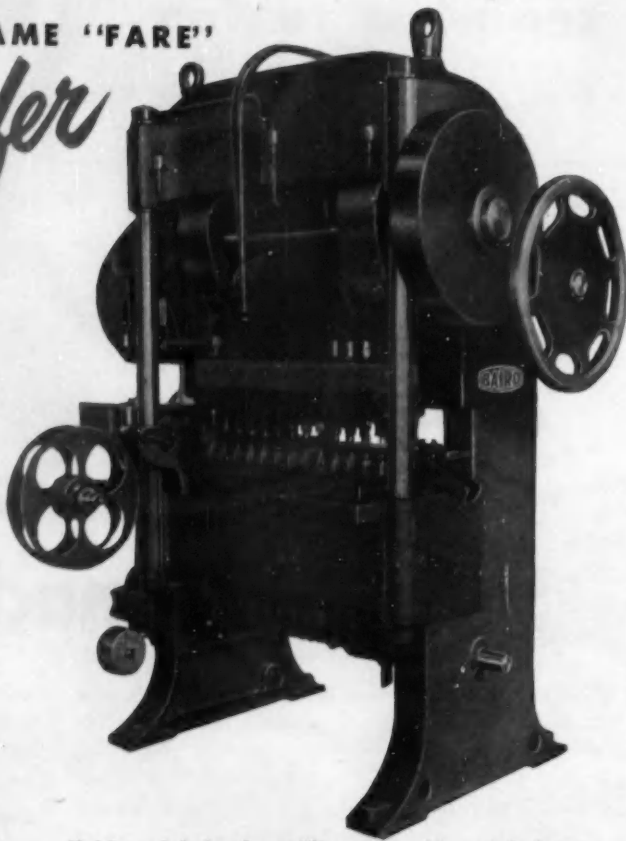
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# Eaton Offers 5 Methods of Increasing Valve Life

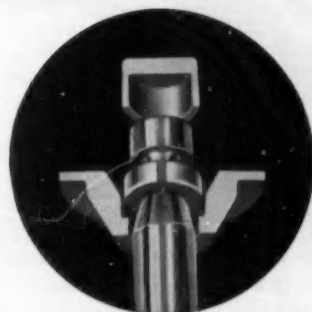


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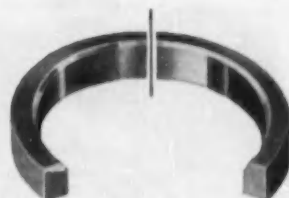
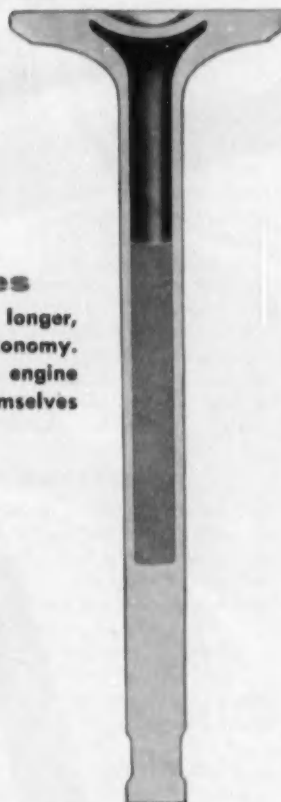
## Eaton Hydraulic Valve Lifters

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# News of the MACHINERY INDUSTRIES

By Thomas Mac New

## MHI Meets

Last month at New York City, the Materials Handling Institute held its ninth annual meeting and elected new officers of the society. President elect is R. H. Davies, vice-president, Industrial Truck Div., Clark Equipment Co., Battle Creek. The First Vice-president and Second Vice-president of the association are respectively George D. Raymond, Jr., executive vice-president, The Raymond Corp., Greene, New York; and C. H. Strauss, partner, Iron Bound Box and Lumber Co., Hillside, N. J.

It was mentioned at the meeting that the potential sales target in 1955 for the industry is \$10 billion. The institute's exposition will be held from June 5 through the 8th, 1956, at Cleveland's Public Auditorium.

## Gear Standards

According to the American Standard Association's B5 sectional subcommittee No. 1, the interchangeability between flat root and fillet root type involute spline gearing is being dropped and each type will be made to meet its own requirements. The committee is also considering revision of the involute serration standard paralleling those being considered for the spline standard. Since the gaging standard covers both splines and serrations, the matter might be simplified by including the serrations with the splines and gaging into one standard. Most important of the revisions being studied concerns machining tolerances, error allowances, and fitting tolerances. Data are being studied to determine tendencies in current manufacturing and inspection. The type of gaging utilized is also being listed and studied. According to G. L. McCain, Engineering Div., Chrysler Corp., chairman of the subcommittee, decisions made by the committee will be based on these data.

## Carbides Lengthen Broach Life

Engineers of the Carboloy Dept., General Electric, claim that Studebaker-Packard Corp. increased its bearing cap broach life by 2500 per



R. H. Davies, president-elect, Materials Handling Institute.

cent when it shifted to cemented carbide tipped tools. Of course, this in turn reduced downtime and tooling changes, thereby decreasing cost. Work is done on a Cincinnati vertical broach with two rams. Speed is 28 sfpm, chip load per tooth, 0.005 in. for roughing; and 0.0015 for finishing. Special round push-type, three-section

Materials Handling Industry Aims at Sales of \$10 Billion During 1955. Carbides Again Show Great Savings in Machining Costs

broaches are employed. Current bearing cap production, using Carboloy grade 883 carbide, is 90,000 parts with one broach setting.

## Five Figure Savings

By switching to mechanically held carbide insert tool holders, a manufacturer of road machinery has been able to cut tool cost \$13,550 for rough turning heavy duty axle shafts on two 16-in. Fay automatics. Using Wesson band-type Multicuts, the output per tool grind increased from 30 to 100. Average depth of cut on all setups using Wesson Co. grade WH carbide is  $\frac{1}{4}$  inch with a feed of 0.012 and a speed of 550 fpm.

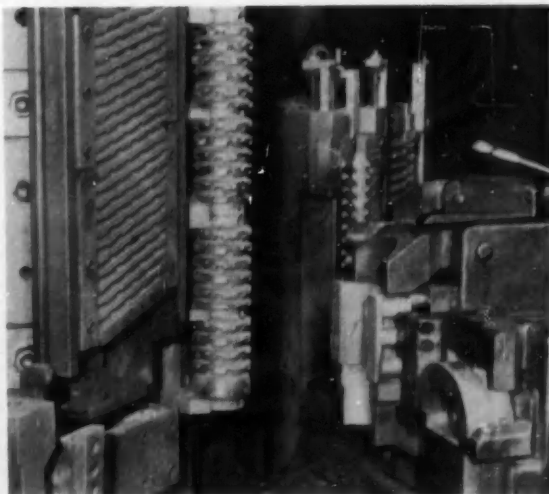
## Around the Industry

Lodge & Shipley, Cincinnati, in Chip Tips, No. 51, instead of giving its usual machine tool case history, has written a very interesting piece on how the new tax law helps your customers and you.

E. W. Bliss Co. reports that machine tools are now coming off the lines of its new San Jose, Calif., plant. The company spent \$1½ million to equip the new plant.

Norton Co., Worcester, Mass., will shortly announce plans for leasing, rebuilding, trading-in, and time payments on some of its standard grinding and lapping machinery.

Carboloy grade 883 carbide tips are used in this broach setup for manufacturing bearing caps at the Studebaker-Packard Corp., South Bend plant.



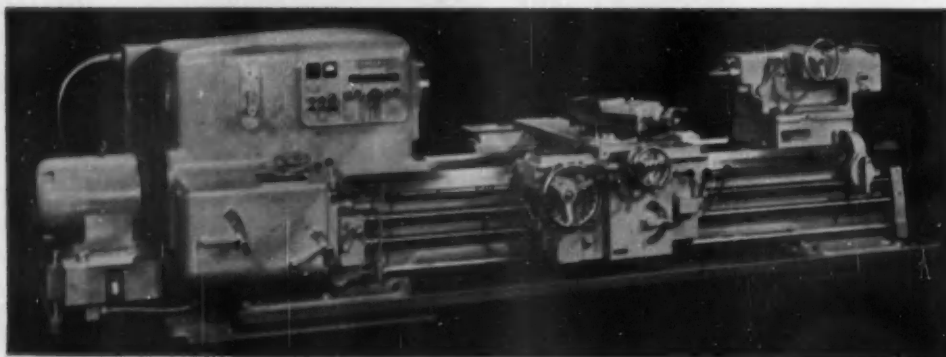
NEW

# EQUIPMENT

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## Heavy Lathe Uses Carbide Tools to Full Advantage



Series 90 Dyna-Shift lathe series features ease of control, rugged construction

**T**HE Series 90 Dyna-Shift heavy duty line of lathes will be offered in three models—each with a main drive motor capacity equivalent to 60 hp. Model 2500 swings 25 in. over the cross slide and has a clearance diameter of 40 in. while Model 2501 swings 31½ in. over the cross slide and has a clearance diameter of 44 in. Model 2502 swings 36½ in. over the cross slide, has a clearance diameter of 48 in. They are designed for metal removal rates of over 100 cu in. per minute.

Simplified control is an outstanding

feature of the machine. The operator sets two dials to pick the right surface cutting speed for a given diameter. One dial indicates the surface cutting speed desired, the other shows the diameter to be turned. Automatically, the headstock gears are shifted hydraulically to give the correct spindle speed. Subsequent changes in turning speed on progressive diameters of the work piece are made in the same manner. An indicator on the front of the headstock reflects the spindle speed for any setting. There are 36 spindle speeds, ranging from

six to 750 rpm. A horsepower meter shows the output of the main drive.

The shift control lever has three positions, FREE, RUN and SHIFT. In SHIFT position, spindle rotation stops immediately. The gears will not shift until the gear train is stopped. In FREE position, the spindle may be rotated easily by hand.

Work start and stop is controlled by dual levers, one at the headstock, the other at the right side of the apron. Positions are RUN, BRAKE and JOG. Monarch Machine Tool Co.

Circle 56 on postcard for more data

## Unmounted Motor Controls

**O**RIGINAL equipment manufacturers can now obtain Variac motor controls without the necessity of buying unwanted cabinets and switching. Sizes from 1/15 to 1½ hp will be made available in this form. All parts except the Variac speed control element are mounted on a metal chassis with connections brought out to a terminal strip. Various circuit arrangements can be used depending on the need for reversing, dynamic braking, etc., but only the Variac and switches need be at the control point. General Radio Co.

Circle 79 on postcard for more data

## Electric Transmission for Tractor



Called the Dynamotive model GLT, a gas-powered tractor with an infinite step electric transmission is designed to provide gentle starting, infinite pull, and smooth acceleration. It has no friction clutch and gear shift mechanism. Draw bar pull is 600 lb normal. Continental engine gives 38 hp at 1800 rpm. (Automatic Transportation Co.)

Circle 57 on postcard for more data



## Self-Loading Broach

**A**N automated broaching set-up broaches the splines in two different models of a differential side gear at a total rate for both gears of 800 per hour.

Gears are fed to four side-by-side broaching stations by means of a continuous chain loading conveyor. It carries 144 individual workholding fixtures mounted four abreast. A standard pull-up broaching machine was adapted to this operation.

A complete 18-second cycle consists of: indexing four gears into broaching position, broaching the splines, indexing the fixtures for broach return, and returning the four broaches through the gaps between workholding fixtures. Small cams on the backs of the fixtures actuate the limit switches controlling the cycle sequence. After broaching, the gears drop out of the fixtures through two separate chutes in each side of the machine.

The conveyor is indexed hydraulically. To insure positive indexing, a second hydraulic cylinder locks each group of fixtures in place for broaching. Forward and reversing clutches eliminate any backlash or override during the indexing motion. Stationary hold-down bars above the broaching station keep each gear seated in its fixture as the broach is drawn through the hole. *Colonial Breach Co.*

Circle 58 on postcard for more data

*Two gears being broached have different hub depths, diameters and spline sizes. No clamping fixtures are required.*



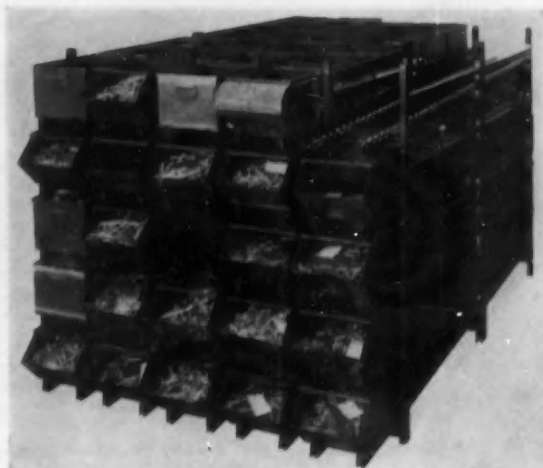
## Parts Bins Conveyorized

**H**ANDLING parts for production, assembly operations, or warehousing is simplified with Rapistan Flow-Rack announced recently. Combining wheel track with rack components, this materials handling device uses Gravity to move goods to its front, where efficient selection can be made with no long aisle walking or hunting. It is free-standing and is entirely removable for use in other locations.

Flow-Rack is made of rolled steel, with corrosion-resistant baked enamel finish. It is produced in six-ft rack height for normal reach, but may be any width or length over-all, and is adaptable to the size, weight and nature of any product. Installations can be extended to increase volume capacity at any time by adding more bays. *The Rapids-Standard Co., Inc.*

Circle 59 on postcard for more data

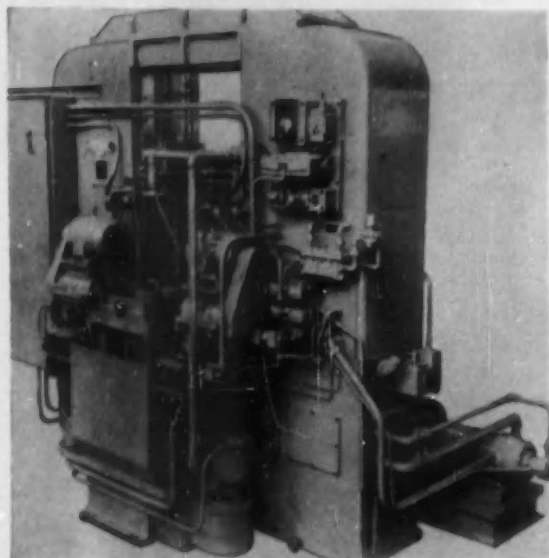
*Flow - Rack gravity parts bins for production or storage.*



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### Broaches and Center-Drills Forgings



Cycle is about 11 seconds, which gives an approximate production of over 300 parts per hour on the American combination broach-drill.

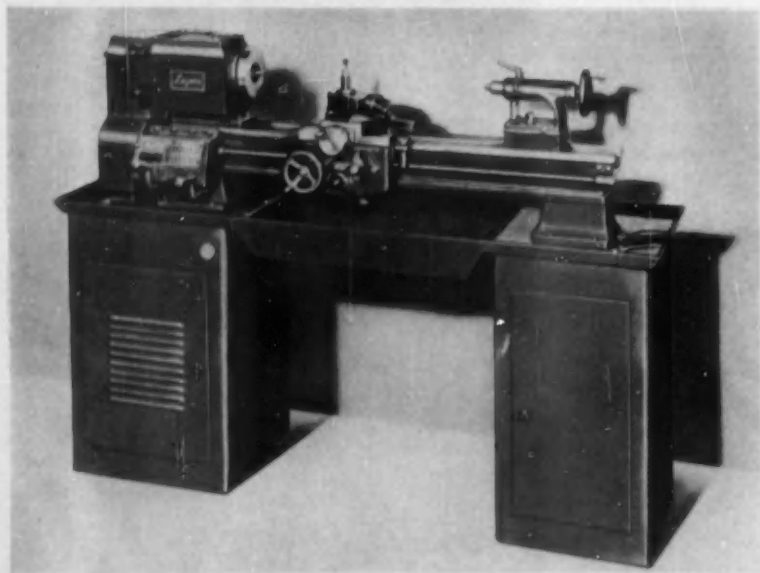
**M**AIN transmission shaft forgings, two at a time, are broached and center drilled on two standard vertical hydraulic broaching machines. Each has 10 ton work capacity with a broaching stroke of 36 in.

The vertical columns of the machines were joined at the base and top to form a rigid integral unit. Mounted on the table is a hydraulically operated lateral slide, which moves the fixture and locks it at the broaching and centering station. The two station fixture holds two parts which are hydraulically clamped.

Four drilling units are mounted two on each side, for the centering operation. A hydraulic feed is used to move the units in and out of position at the centering station. Separate electric motors rotate the drills for the centering operation. After the operator loads two parts in the fixture, the parts are automatically clamped and move into broaching position. Surface broach sections approximately 30 in. long move down, broaching approximately  $\frac{1}{4}$  in. of stock from each end of the forged parts. The slide then moves back to the centering station, where four center drills simultaneously move in to center drill the ends of the two parts. American Broach & Machine Co.

Circle 60 on postcard for more data

### Lathe Line Re-Engineered



All models have a large chip capacity, drop center pan, and three storage compartments completely enclosed.

**E**IGHT models in a line of 12-in. swing lathes are now in production. Improvements over previous models include wider gears, larger shafts, heavier bearing supports and a heavier base. The line consists of four turret and four screw cutting models.

Principal specifications include 12-in. swing over bed;  $7\frac{1}{4}$ -in. swing over saddle;  $1\frac{1}{2}$ -in. spindle hole; one-in. collet capacity; 23-in. and 35-in. centers. Variable speed drive or standard double V-belt drive is optional on all models. These features together with more power are designed to provide extreme smoothness in operation and sustained quiet operation.

The carriage rides on a two-V-way, two-flat-way bed that is rigid, precision ground, and warp-free. Other features include a special alloy spindle which turns on a double row of oversize ball bearings. No bearing adjustment is needed for any spindle speed within the range. Logan Engineering Co.

Circle 61 on postcard for more data

## Analog Computer

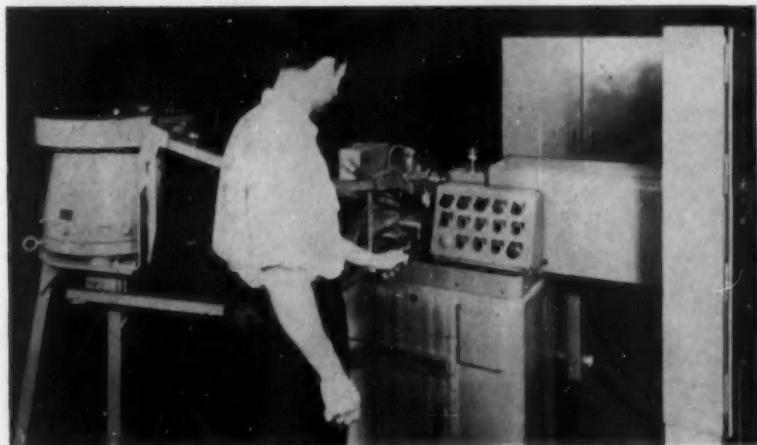
**N**ONLINEAR analog computer model GN215-N3 GEDA is now in production. Custom-designed to meet varied requirements of individual owners, the N3 is said to have practically unlimited applications when used in conjunction with other analog computing equipment. Typical applications include solution of problems in electric motor design and control, servomechanism design, fluid and heat flow, power system design and control, and simulation of such devices as brakes, cams, clutches, gear trains and turbines.

The N3 is a basic unit containing regulated power supplies, stabilizers, calibrators, a control panel and spaces for 10 auxiliary computing units. A wide variety of plug-in computing units is available and can be utilized, singly or in combination, for linear and nonlinear calculations, generation of functions, multiplication, summation and establishment of reference voltages.

As new units are developed, they can be added to the N3 to extend its applications. Connector plugs make possible 250 input-output connections, with the signal junction box permitting complete flexibility of signal connections. The device provides automatic stabilization of as many as 76 d-c amplifiers.

Designed for use with the L3 GEDA linear analog computer or similar equipment, the N3 extends the range of linear computers into new fields, and broadens their application in those fields where linear computers were previously limited. *Goodyear Aircraft Corp.*

Circle 62 on postcard for more data

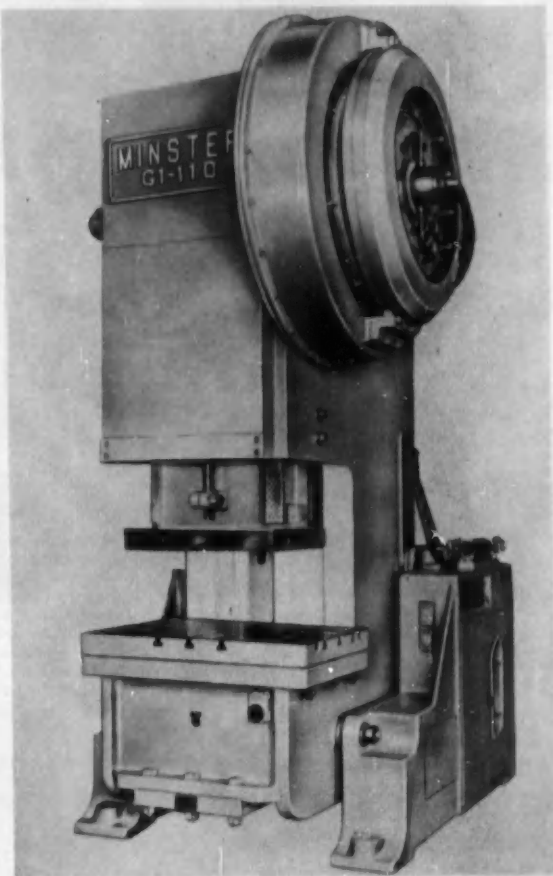


Diverter, manually operated, directs unsatisfactory gears to the top of the unit, where the operator can deburr in pencil grinder.

## Press Designed for Automation

Fabricated steel gap presses recently introduced are typified by the G1, 110-ton geared press shown, especially adapted to automation. It features built-in panel-leg control cabinets containing all electrical, air and lubrication controls for press or automation equipment. Single entrance connections for air and power permit quick connection. Adjustable-in-motion rotary limit switch for synchronizing is direct driven through mitered gears, providing three or more circuits. Standard stroke is five in., with 80 or 105 strokes per min on fly-wheel press and 37 on geared press. (*Minster Machine Co.*)

Circle 63 on postcard for more data



## Gear Sound Testing Automated

**M**ODEL GSC Red Ring automated gear speeder inspection unit

automatically loads, speeds spur and helical gears for sound test and unloads the gears onto a conveyor line. The operator listens to the sound of the production gears as they are rotated in contact with a master gear and diverts any gears from the unloading chute which do not meet standards for sound.

Gears from a conveyor are directed to a vibrating type hopper feed device in the unit from which they are fed through an input chute to a storage magazine ahead of automatic loading device on the speeder. The hopper feed operates intermittently and is controlled by the loading condition of the input chute. Push button controls are included for setup operations. The cycle of load-speed-brake-reverse speed-brake-unload is automatic. *National Broach & Machine Co.*

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### Firm Enters Lathe Field

**I**NTRODUCTION of an 11-in. cabinet model variable speed drive lathe with 24-in. capacity center to center and one-in. collet capacity, announces the entry of the manufacturer into this field. A feature of the new tool is a patented back gear shift lever located on the front of the machine. There is said to be no need for using wrenches, pulling out pins, or opening guards to shift from direct spindle drive to back gear spindle drive, loose or locked spindle.

Infinite speeds from 44 to 1550 rpm can be selected without turning off the machine. The drive is designed to run cool and retain its lubricant. A new type of V-belt which minimizes wear and prolongs belt life is an added feature of this drive. The lathe is offered with a choice between 2¼ in.-8 threaded spindle nose and LOO long-taper spindle nose. The spindle is carried on two tapered roller bearings on the inboard end and a floating sealed ball bearing, on

the outboard end. Additional features of the lathe are:

A precision ground bed provided with separate V and flat ways for

carriage and tailstock; a lead screw shear pin supplied as standard equipment; quick-change, non-jamming feed controls without interference with the carriage or feed change levers.

There is a total of 48 thread and feed changes with thread range from four to 224 and feed rate range per revolution from 0.0902 to 0.0016 in. longitudinal and 0.0301 to 0.0005 in. cross. *Delta Power Tool Div., Rockwell Manufacturing Co.*

*Circle 65 on postcard for more data*

*A full line of accessories including a taper-turning attachment designed for accuracy and easy manipulation, and micrometer stops, milling attachments and a standard type of collet chuck, is offered with the Delta lathe.*



### Fastens Bearing Caps While Block Moves

**A**MACHINE which will automatically set ten bearing cap bolts on a V-8 engine block has been delivered. The nut-running unit is powered by ten air motors and is self-supported by a steel framework which straddles the assembly line. Capacity is 200 blocks per hour.

The nut running unit slides on its framework guides at a corresponding pace with the block. As the block reaches the machine, it is rough centered by fences and rollers, and then triggers the mechanism into motion. The nut running unit lowers and is positioned by pilot pins. The nut runners set the bolts, automatically cutting off when stalled at torque. Motors are then bled and the overhead cylinder withdraws and returns the unit to the starting position. *Cleco Div., Reed Roller Bit Co.*

*Circle 66 on postcard for more data*

*The Cleco nut runner for fastening bearing caps "on the fly"*





## Surface Grinder Prefinishes Stamping Blanks

**A**UTOMOTIVE bumperettes will be prefinished before they are formed, on a 20-in. surface grinding machine recently installed. It is designed to reduce or eliminate any further finishing operations prior to plating. The four-head grinder uses progressively finer grinding belts. Blanks enter the 36-ft machine on a neoprene conveyor belt. Rubber hold down rolls and permanent magnets used at the point of grinding prevent slippage of blanks. The machine is built for dry operation as well as wet abrasive grinding with cutting oil, or with water. Adjustments of grinding heads for various thicknesses of stock can be made through centrally located push-button control. Automatic tensioning and tracking is provided for the abrasive belts. Conveyor speed is infinitely variable from 15 to 60 fpm. *Curtis Machine Corp.*

Circle 67 on postcard for more data



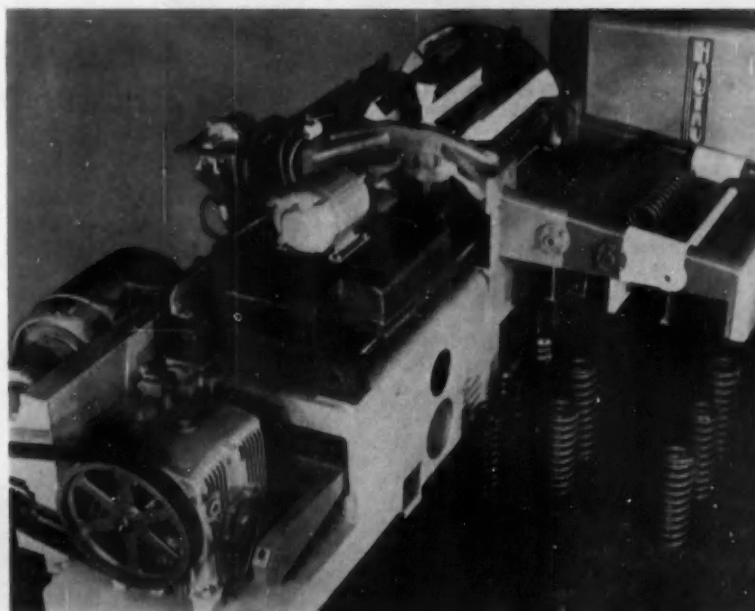
This particular machine will take stock up to 20 in. in width and any length.

## Interval Generator

**T**HE model 3157 multiple-sequence megacycle preset interval generator provides a convenient means of generating a series of preset time delays adjustable in increments of one microsecond. The system includes a one-megacycle crystal-controlled master oscillator that feeds one or more preset counters capable of producing an output pulse any desired number of counts (microseconds) after application of a start pulse.

Provisions are made for using the equipment as a multiple-channel interval timer. Pulses defining an interval are used to open and close an electronic gate that causes one-microsecond-spaced pulses to be counted during the unknown interval. Direct indication in microseconds is by means of neon lamps arranged in binary-coded decimal form. *Potter Instrument Co.*

Circle 68 on postcard for more data



## Springs Tested and Classified

Springs for passenger cars are tested and classified at a rate of 700 per hour automatically in this machine. The springs are classified as: Soft-good, hard-good, soft-no good and hard-no good. A continuously operating mechanical ram driven by a Michigan Tool Co. Cone-Drive speed reducer compresses the spring to its solid height at the first station and provides load calibration at the second. An electric clutch brake prevents the ram from moving forward while the machine is indexing. (*Hautau Engineering Co.*)

Circle 70 on postcard for more data

## Diesel Muffler

The Cyclone muffler is designed to capture carbon particles from the exhaust stream of gas or Diesel powered trucks and eliminate the discharge of ignited solids in exhaust gases. Centrifugal action is employed to throw ignited solid particles into a collector leaving only the gases free for exhaust. Factory Mutual approved, it does not require water. *Yale & Towne Manufacturing Co.*

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**NEW**

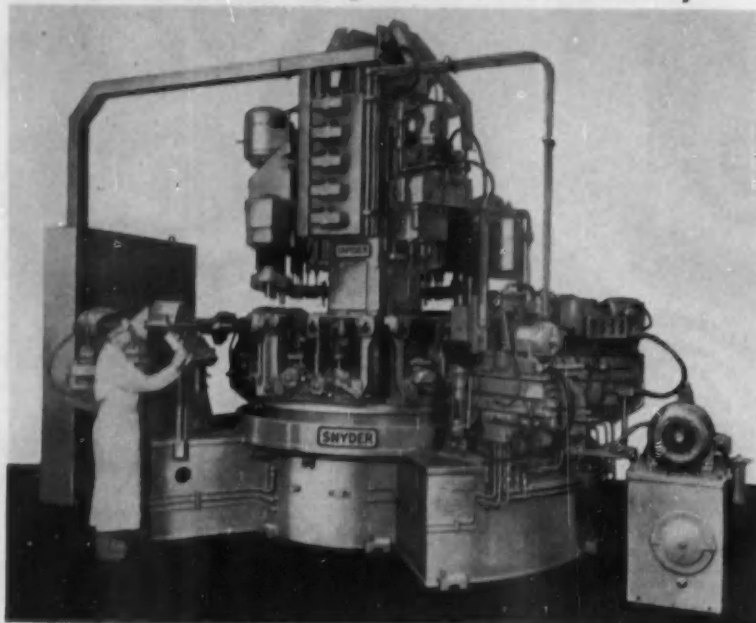
**EQUIPMENT**

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## Special Drills Bearing Retainers Automatically



A central system on this Snyder special provides lubrication for all sliding and rotating surfaces and is manually operated through a handle located near the loading station. A mist system is provided to lubricate the taps

**C**AST iron rear bearing retainers on automotive transmissions are processed through an automatic cycle on a six-station, center column special machine. It features vertical and horizontal units and hydraulically operated index table. Operations performed are drilling, reaming, spot-facing, chamfering and tapping on two sides and top and bottom of the part. The workpiece is cast iron and production is 80 pieces an hour at 80 per cent efficiency.

Work cycle is automatic and the machine may be operated by semi-skilled help. It is electrically interlocked to safeguard both the operator and the machine. Emergency stops are provided in the electric control panel and at the push button station. All tools are properly guarded.

The fixture is a two-position, pump jig type and is manually operated. Tools are high speed steel and tungsten carbide tipped cutters. Tool speeds are 80 sfpm on drills and cut-

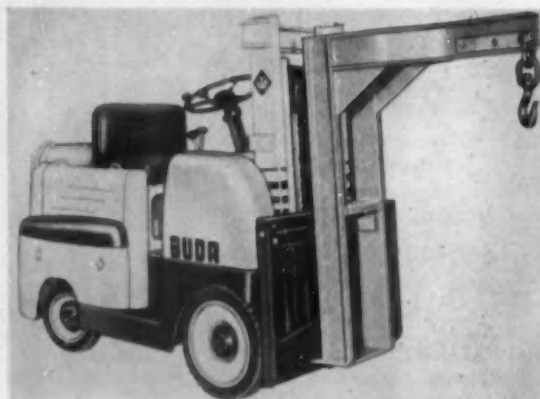
ters with infeed of six in. per minute; 30 sfpm on taps; 40 sfpm on reamers with infeed of three in. per minute. Tools are changed manually Snyder Tool & Engineering Co.

Circle 71 on postcard for more data

A crane arm recently developed provides a quick method for handling loads where forks or clamps are not applicable. They are available in sizes from 24 to 72 in. and include such features as adjustable load center; easy installation; may be used with or without forks; constructed of reinforced channel steel. Special sizes are available. (Buda Co., Div. of Allis-Chalmers Manufacturing Co.)

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## Crane Arm for Fork Truck



## Fixture Clamps

Two De-Sta-Co clamps for light duty are designated as 509-U and 509-S (pictured). They feature low silhouette, complete clearance of



De-Sta-Co clamp for holding sheets of metal, plastic or wood.

working area, flop-over action and a plastic handle grip. The angular-flange base permits mounting by bolts or welding to side of fixture. When mounted vertically the holding bars flop completely over the side of fixture to produce a positive firm clamping action at a 45 deg angle directly against upright fixture base.

Cone-tipped adjustable spindles of bonded neoprene may be easily attached to the 509-U or welded to the 509-S.

The 509-U of 375-lb capacity is distinguished by its U-shape holding bar, recommended where welding facilities are not convenient. The 509-S of 500-lb capacity features a solid carbon-steel work-holding bar to which a wide variety of spindle-assemblies may be attached. Detroit Stamping Co.

Circle 72 on postcard for more data

## Scrap Chopper

**T**HE Birtwell scrap chopper introduced recently is designed to prevent jamming the feed system for roll stock on punch presses. The complete unit is suspended to float freely from its base. With waste stock passing through the cutting slot, the unit rocks down with the jump of the stock, cuts, then rocks back up to "grab" another chunk. Thus, all back pressure is eliminated, and stock is not bowed. The portable unit can be moved from press to press as needed. Heavy duty cutters are interchangeable, with a capacity of stock up to three in. wide by 0.050 in. thick. *Northeastern Development Engineers.*

Circle 74 on postcard for more data

## Portable Cleaner



Rapid maintenance cleaning of machinery without dismantling can be done with the Steam Kleen jet sprayer being introduced. The Mighty Midget model No. 111 steam jet feed is operated by finger tip control. Changeover from wet to dry steam is by tilting the unit from horizontal to vertical position. Operating weight is 16 lb. (*Henry Flow Control Co.*)

Circle 75 on postcard for more data

## Test Fitting

**A** LONG union has been added to a line of tube fittings, provided in both the Tripl-lok flare type HHBTX and the Ferulok flareless type HHBU. It offers an important replacement advantage for test hook-ups. It has an overall length exactly the same as the overall length of the union tee, the male outlet tee and the union cross, providing interchangeability with these fittings. *The Parker Appliance Co.*

Circle 76 on postcard for more data

## Bending Machine Operates Two Ways



Typical production rate on Pines two-way bender is said to be 300, 90-deg bends per hour on largest size steel tube.

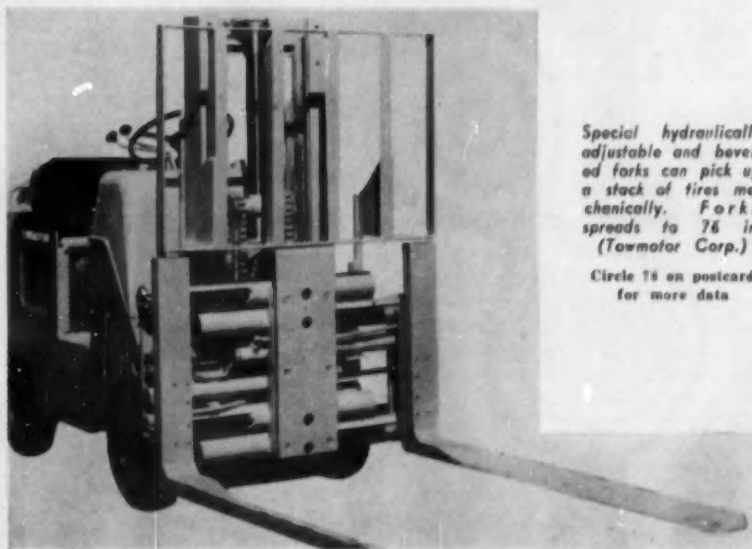
**A** HORIZONTAL semi-automatic tube bending machine is designed for both left-hand and right-hand operations. The series 1400-A has an extended main spindle and double ways mounted on the top and bottom of both the stationary and swinging arms. The head and top assembly is double-hinged to the base to permit turning over the entire assembly 180 deg. Tools can be interchanged quickly and easily, or secondary tooling can be mounted.

This machine has a maximum cap-

acity of one in. OD 16-gage steel tubes. It has a self-contained hydraulic system, lever-operated toggle-type clamp and pressure die holders, manual angle-of-bend selector with either six or eight-position turret, and a three-hp ball bearing motor. Clamp and pressure die holders and the bending form can be quickly removed and re-mounted. The bending forms are mounted on two studs, one of which is equipped with a hold-down nut. *Pines Engineering Co.*

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## Hydraulic Forks Handle Tires



Special hydraulically adjustable and beveled forks can pick up a stack of tires mechanically. Forks spreads to 7 1/2 in. (*Towmotor Corp.*)

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# NEW

# PRODUCTS.

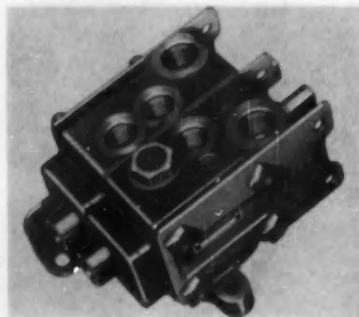
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## Multiple Valve for Mobile Machinery

Compact multiple unit valves specifically for mobile machinery service, series CM 11, are designed to provide improved metering characteristics. This permits greater precision in nudging, crowding, and inching operations. The valves are made up of standardized and interchangeable units assembled in combinations (up to eight sections) between special combination inlet and outlet units. The new inlet section is a single casting that combines inlet manifold, operat-

ing valve and relief valve; the new outlet unit is also a one-piece casting combining outlet manifold, operating valve and end plate. Individual end plates are also available for a single valve. The series is available in double-acting and single-acting operating valves as well. "O" ring seals are provided between valve sections for use with Vickers V200 pump (up to 11 gpm). Maximum working pressure is 2000 psi. *Vickers, Inc.*

Circle 36 on postcard for more data

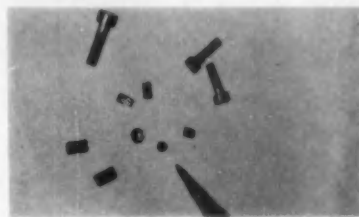


## Small Socket Screws Now Standard

Socket head cap and set screws in sizes from No. 4 (0.112 in.) down to No. 0 (0.060 in.) are now being offered as standard items. The line is made in both 18-8 stainless steel and heat-treated alloy steel, in a variety of lengths and threads. Socket screws

are available in either the "hex" socket or the multiple spline socket. The firm's complete line includes hex socket flat head cap screws, pipe plugs and stripper bolts, and cap and set screws. *The Bristol Co.*

Circle 37 on postcard for more data

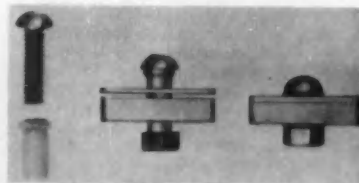


## Nylon Sleeve for Bolt, Screw or Rivet

A nylon sleeve utilizes cold-flow properties for improved fastening and sealing with bolt, screw or rivet. Vibration-proof, leak-proof sealing is formed when a short length sleeve is used under the head. Called Nyltite,

the sleeve retains a slight tendency to resume its former shape, to function as a lock washer. The seal will withstand temperatures up to 250 F. *Keystone Plastics, Inc.*

Circle 38 on postcard for more data



## Convertible Top Material

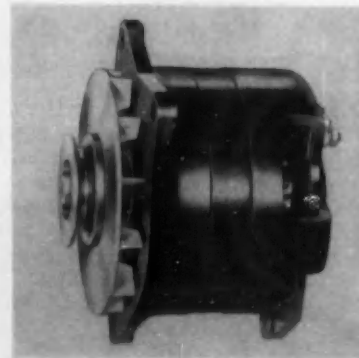
A convertible top material named Duratop is made of a tough vinyl coating supported by a specially woven textile base to impart strength and durability, as well as wear and tear resistance. Color is impregnated in the vinyl coating. It also is claimed to be resistant to shrinking, stretching, staining, leaking, rotting, scuffing, cracking, mildew and fire. *Textile-leather Div., General Tire & Rubber Co.*

Circle 39 on postcard for more data

## Alternator System

A line of six- and 12-volt alternator electrical systems recently announced is said to be competitively priced with a standard d-c system. New models include light-duty and heavy-duty units, both with capacities of 12 v, 50 amp and six v, 60 amp. The alternators are expressly designed for fleets of small trucks used for delivery purposes, and for fleets of over-the-road trucks, used for long or short hauls. *Leece-Neville Co.*

Circle 40 on postcard for more data





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## FREE LITERATURE

### Motor Drives 1

Technical data on various electric motor drives, including liquid and air-cooled couplings, stationary field couplings, dynamometers, press drives and special units, are outlined in 16-page bulletin GB-2. *Dynumatic Div., Eaton Manufacturing Co.*

### Small Recorders 2

Tel-O-Set miniature recorders and controllers with a quick-connect feature are illustrated in a 12-page booklet now available. Booklet 7201. *Minneapolis-Honeywell Regulator Co., Industrial Div.*

### Thermocouples 3

Serv-Rite thermocouple elements and bare thermocouple wire are described, together with prices in form No. 14-15-54. *Claud S. Gordon Co.*

### Plant Communications 4

A fully illustrated brochure now available gives graphic descriptions of communications problems in six areas: handling incoming materials, production planning, quality control, materials handling, sales order and maintenance control. *TelAutograph Corp.*

### Large Butt Welder 5

Said to be the world's largest flash-butt welder, a one-million-lb upsetting and forging unit for aircraft landing gear production at Cleveland Pneumatic Tool Co. is described in Weld-It, No. 5411. *Taylor-Winfield Corp.*

### Clutch Data 6

A reference file on cam clutches for indexing, overrunning and backstop applications includes an eight-page catalog and four additional catalog sheets on the PB series, HT series, MC series and K series cam clutches. *Morse Chain Co.*

### Stainless Castings 7

Technical articles discussing the newer stainless casting alloys, designing castings, shell molding, alloy properties chart, etc., are features of Vol. 6, No. 3 of Newscast. *Cooper Alloy Corp.*

### Aircraft Pumps 8

A picture story of the company's history, experience and operations, including its product line, is interestingly presented in bulletin RO-103. *Lear, Inc., Lear-Romes Div.*

(Please turn page)

1/1/55

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## Aviation Fans 9

The line of Axivane fans for aviation and electronic applications feature aluminum and magnesium construction. Eighty models are covered in bulletin J-614. *Joy Manufacturing Co.*

## Rubber Handbook 10

An 82-page manual covers design and specifications of materials for engineering various types of rubber seals and gaskets. *Minnesota Rubber and Gasket Co.*

## Power Punch Presses 11

The Emco line of power punch presses in five and 10-ton capacities are covered, together with prices, in a folder now available from *Klaas Machine and Manufacturing Co.*

## Machine Drives 12

Roller gear drives for high speed precision indexing are completely specified and described in 20-page catalog No. 105. *Ferguson Machine & Tool Co., Inc.*

## Way Lubricant 13

Sunoco Way Lubricant, a special lubricant for the ways of machine tools is compounded to eliminate so-called stick-slip or jump table. Form A-3032. *Sun Oil Co.*

## Vacuum Alloys 14

General data on vacuum-melted metals and alloys, as well as several commercial services now available in connection with such metals, are included in technical bulletin VM-100, 16 pages. *Carboloy Dept., General Electric Co.*

## Teflon Properties 15

A description and illustration of the technical properties of Teflon tetrafluoroethylene resin is given in issue No. 52 of the *Product Engineering Bulletin*. *Polychemicals Dept., Du Pont Co.*

## Two-Point Presses 16

The firm's first catalog describing its new line of Steelweld two-point presses of 160 to 500 tons capacity is now available. No. 2018. *Cleveland Crane & Engineering Co.*

## Small Fork Trucks 17

A treatise on uses of the small fork truck was written to show how small and medium size plants can compete in materials handling efficiency. *Market Forge Co.*

## Chromate Finishing 18

File of technical bulletins on the Iridite chromate conversion coatings for prevention of corrosion and paint-base treatment of non-ferrous metals is available from *Allied Research Products, Inc.*

## Voltage Stabilizers 19

Details of a line of voltage stabilizing equipment for industry are available in a 16-page catalog, 4-260. *Raytheon Manufacturing Co.*

## Starter Catalog 20

A line of air-break electric starters for 2200-5000 volt motors are described in folder 1060. *The Electric Controller & Manufacturing Co.*

## Epoxy Adhesive 21

Technical data and prices on epoxy resin adhesives for bonding metals, wood, glass, ceramics, hard rubber and thermosetting plastics are offered in a 16-page brochure. *Armstrong Products Co.*

## Air Clutch 22

Features of the Air-Grip clutch for machinery are illustrated, specified, and prices listed in bulletin A-634. *Dodge Manufacturing Corp.*

## Speed Reducers

Speed reducer catalog No. 120 features revised rating tables of herringbone and spiral bevel-helical units. Write on company letterhead to *Brad Foote Gear Works, Inc., 1309 S. Cicero Ave., Chicago 50, Ill.*

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## A PINCH OF LEAD FOR FAST, CLEAN CUTTING

Lead added to Aristoloy Steels acts as a lubricant and reduces friction between tool face and chip. It also produces a better chip formation, allowing higher machining speeds to be employed. Many users report improved machinability ratings, up to 100 for leaded steels as compared to 60 or 70 for the same material unleaded.

Better finish and longer tool life are additional benefits. Heat treating and mechanical characteristics remain unchanged.

Call your local representative or write today regarding application of leaded Aristoloy to your product.



ARISTOLOY  
STEELS

**COPPERWELD STEEL COMPANY**  
(STEEL DIVISION) WARREN, OHIO



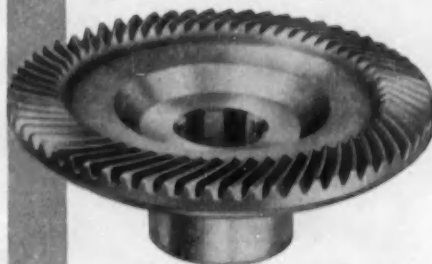
### BALL STUD

Use of 8640 Leaded improved automatic screw machine production nearly 40% for a large job shop. Production per machine hour increased from 108 to 150 pieces.



### SPUR GEAR

A machine tool manufacturer cut machining time  $\frac{1}{2}$  by switching to Aristoloy 4140 Leaded. And finish was greatly improved—from FAIR to EXCELLENT.



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Machinability was increased 25% when Aristoloy 4140 Leaded was substituted for non-leaded AISI equivalent. Biggest saving from a cost standpoint was a 75% improvement in tool life.

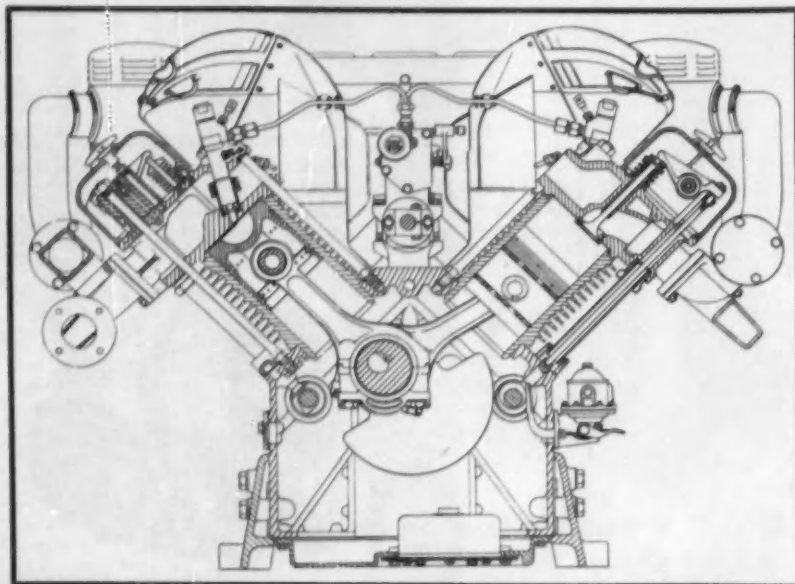
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# Aircooled Automotive Diesels

*introduced in*  
**England**

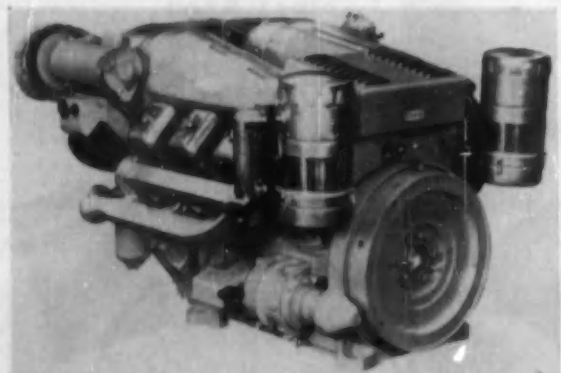
**By David Scott**



*Transverse section of the V-6 and V-8 aircooled Diesels rated at 72 and 96 hp at 1800 rpm.*



*Front quarter view of Petter-McLaren PDV8 aircooled Diesel. The crankcase of this V-8 is machined to take mounting feet or supports for various industrial and automotive installations.*



*Rear quarter view of Petter-McLaren PDV6 aircooled Diesel. The oil cooler is mounted between the two cylinder banks in the air flow-path from the twin cowls.*

**LONDON, ENGLAND**

**B** RITAIN'S first answer to the large aircooled Diesels made in Germany and Switzerland is two new V-6 and V-8 engines built for automotive and industrial uses by J. & H. McLaren, Ltd., of the Brush Group. The V-6 develops 72 hp and the V-8 engine 96 hp at a maximum governed speed of 1800 rpm. Piston displacements of these over-square units are 413.2 cu in. and 551 cu in., with bore 4.5 in. and stroke 4.33 in.

The two banks of individual finned cylinders, set at 90 deg, are cooled by separate belt-driven, axial-flow blowers. Each line is completely cowed, and an oil cooler is located between the cylinder banks at the flywheel end of the ducting.

Cylinders and heads are cast iron, the latter incorporating directional ports and masked inlet valves. Twin camshafts are carried in the crankcase. Combustion chambers are formed by hemispherical bowls in the heads of the aluminum pistons. There are three compression rings (top one chromium plated) and two oil rings. Compression ratio is 16 to 1.

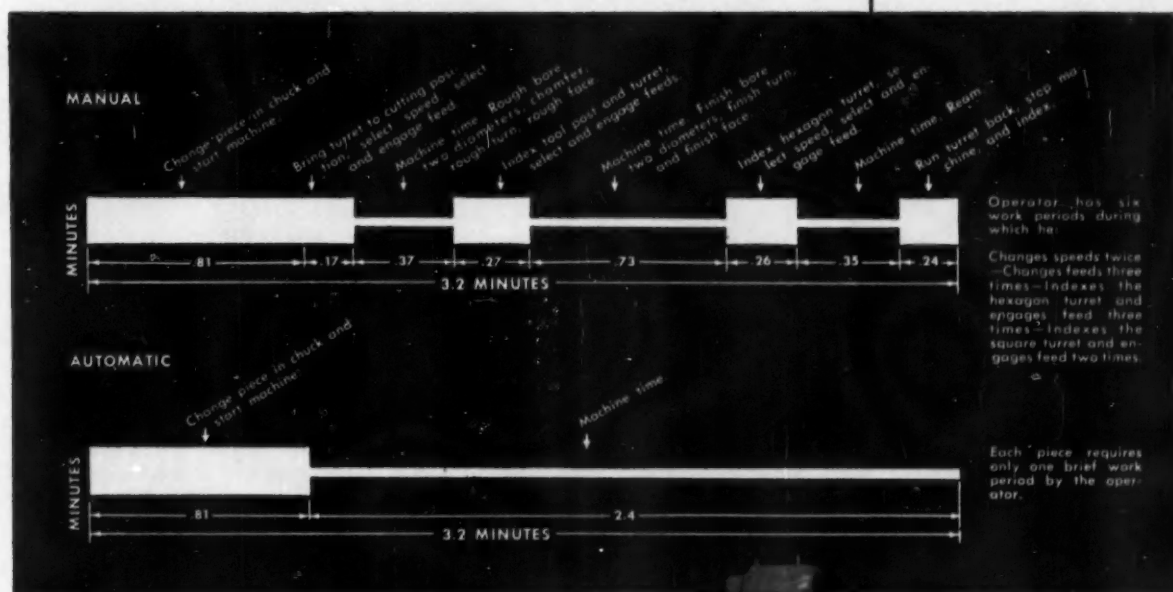
Direct injection through multi-hole nozzles is used. The injection pump, of which the V-8 has two in tandem, is mounted between the cylinder banks. The fuel lift pump may be driven from the camshaft on  
(Turn to page 106, please)



# how the GISHOLT FASTERMATIC saves man-minutes and money!



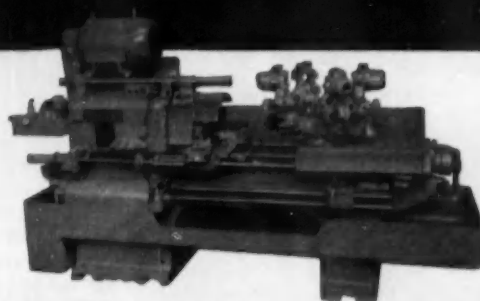
Here is an actual comparison of the time and work cycle of a manually operated turret lathe and a Gisholt Fastermatic Automatic Turret Lathe. The machining of wheel hubs, shown above, requires 6 operations as follows: rough bore, finish bore, ream, rough face, finish face and chamfer. Note that the manually operated machine takes over 54% of the operator's time whereas the Fastermatic takes only 25% of his time, leaving 75% without interruption.



That's the story of the Fastermatic in a nutshell—less work time for the operator. The Fastermatic handles all changes of feeds and speeds automatically.

In this case, for example, the other side of the work piece is done by another Fastermatic with substantially the same cycle. One operator keeps both machines constantly under cut and still has ample time for stacking and work inspection. Important, too, is the fact that both Fastermatics are tended by a comparatively unskilled operator.

There are many such cases where Fastermatics can cut costs substantially. Gisholt engineers will gladly answer your questions. Write us.



**THE GISHOLT 1-F FASTERMATIC**—smallest of 3 different sizes which enable you to machine a maximum number of surfaces in one chucking, handling all changes in speed and feed automatically. On this job, turret was double-tooled so that two parts were completed with each revolution of the turret. Ask for literature.

**GISHOLT MACHINE COMPANY**  
Madison 10, Wisconsin



THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.

# NEW

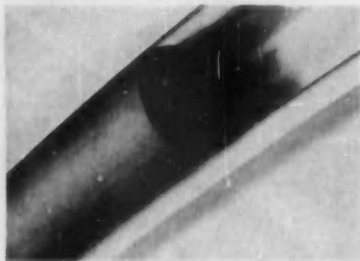


## AIRCRAFT PRODUCTS

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

### Fire Isolating Seals

Fire wall sealing materials, called Fyre-tite, can be fabricated into a wide range of design sizes and shapes to suit specific requirements. A combination of specially formulated

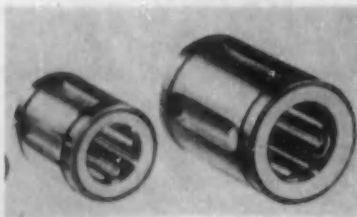


sponge rubber or other materials are encased in fiber glass fabric. Tests are reported to prove the material to be fireproof under 2000 F direct flame for 15 minutes. Seals are available which are exceptionally resistant to engine fuels and lubricants and will retain their flexibility and resilience under wide temperature extremes, according to the manufacturer. Arrowhead Rubber Co.

Circle 46 on postcard for more data

### Stainless Bushing

Production of a series of all-stainless-steel ball bushings has begun. These ball bearings for linear motion will be manufactured for shaft diameters of  $\frac{1}{4}$ ,  $\frac{3}{8}$ ,  $\frac{1}{2}$ , 1, 1 $\frac{1}{2}$ , 2, 2 $\frac{1}{2}$  and 3 in. This new series will be made to the same basic dimensions as the chrome steel Series "A" bearings made by the company. For slow and moderate speeds, the stainless bushing is said to operate without lubrication.

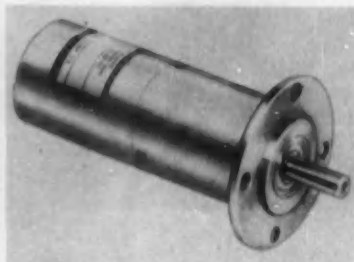


The load carrying outer sleeve and the balls are made from type 440 stainless steel which permits them to be hardened to 60 Rockwell C, and the retainers and end rings are made of type 303 stainless. Thomson Industries, Inc.

Circle 47 on postcard for more data

### Gear Motor

A so-called sub-miniature, planetary gear reduced motor measures only  $\frac{3}{8}$ -in. in diameter and weighs as little as five oz. This package consists of an SS Moto-Mite permanent magnet d-c motor, and a system of precision planetary gearing. Overall length varies from 2 $\frac{1}{4}$  to 3 11/16 in.



Nineteen different standard reduction ratios are available.

Units can be furnished with speed governors for applications requiring close speed control; however, overall length must necessarily be increased to include this feature. Standard mounting flanges or custom made flanges can be supplied. Separate radio noise filters are also available. Globe Industries, Inc.

Circle 48 on postcard for more data

### Air Cooled Generators

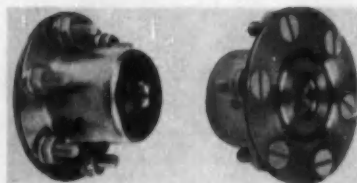
An air-cooled a-c generator capable of operation at environmental temperatures as high as 120C is said to deliver full rating continuously at this temperature. Improved insulation, increased air-handling capacity and open generator design are mentioned

as responsible for the improved performance. Jack & Heintz, Inc.

Circle 49 on postcard for more data

### Tank Drain

A water drain valve for aircraft fuel tanks, designed for rapid drain-



ing, is said to be easily installed in the bottom of a fuel tank. Built of stainless steel and using a replaceable O-ring seal it is self-closing and positive in operation. It is flush mounting and has a thin flange built to individual requirements. Steel Products Engineering Co.

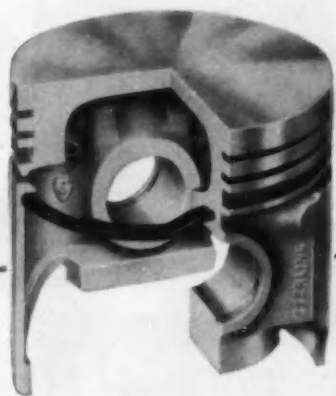
Circle 50 on postcard for more data

### Fire Chemical

Fluorinated hydrocarbon compounds, similar to those that act as cooling agents, are said to provide safety, easier handling, and weight savings in fire-fighting equipment for use on airplanes. These compounds feature extremely low toxicity, negligible effect on metals, and the ability to deliver a very high volume of flame-smothering vapor at all flight temperatures.

The new fire-fighting system, first employed by Lockheed, is a high rate discharge system (HRD) developed by the Civil Aeronautics Administration technical center at Indianapolis. The standard fire-fighting agent supplied by Lockheed on all delivered planes is Freon-12B2 dibromodifluoromethane. One of the most significant modifications adopted in the Lockheed installation is extension of fire protection to Zone 1, or the piston area in the forward end of the engine nacelle. Du Pont Co.

Circle 51 on postcard for more data



1953

**STERLING** introduced a new, amazing piston

1954

**ONE** car manufacturer selected the new piston

1955

# **7** Manufacturers specify **STERLING** **CONFORMATIC\*** **PISTONS**

**In 1956...** there will be more! This quick acceptance by automotive engineers is a result of the demonstrable superiority of Sterling Conformatic Pistons. Sterling Engineers will be glad to show you how Conformatic Pistons can improve your engine's performance. Conformatic eliminates cold slap, scuffing and frictional power losses... because it conforms exactly to the cylinder walls over the entire operating range. Your Sterling Engineer can give you complete details and arrange a test.

**Now LOW-COST**  
**RING LAND PROTECTION**  
*in Sterling CONFORMATIC Pistons*

Ring grooves lined with lightweight intra-cast steel inserts give Sterling Conformatic Pistons even longer life... greater efficiency. An optional feature for truck and passenger car pistons.



**STERLING ALUMINUM PRODUCTS INC.**  
ST. LOUIS, MISSOURI

# METALS

*Domestic Copper Situation and Steady Consumption in Europe.  
Zinc Statistics Encouraging. Tungsten Fixed Price Problem.*

By W. F. Boericke

## Steel Forecasts Low

Forecasts of steel ingot production made a month ago have turned out to have been definitely on the low side and have had to be hastily revised upward. By mid-December operations were scheduled at 82 per cent of rated capacity, and instead of the usual seasonal tapering off for the holidays, an insistent demand is expected to keep furnaces operating without lay off, an unusual condition for December.

The amazing rate of recovery is reflected in the 36 per cent increase in operating rate from the summer low of 60 per cent to the present figure. *Iron Age* emphasizes that the trend is still toward more new orders, bigger backlogs, and extended delivery schedules. New business is coming in faster than the finished steel is getting produced and shipped. Mills serving the automotive industries are sold out for the first quarter and some steel makers are booking orders for the second quarter.

Most of the buying appears to have been for filling manufacturing needs and not for inventory building, although it is freely acknowledged that inventories had been allowed to become too low. Steel producers are screening orders to prevent duplication which was prevalent some time back.

In strongest demand have been cold rolled sheets, galvanized sheets, and silicon sheets for electric motors. Urgently wanted are hot and cold rolled bars. Weaker features included tin plate and particularly rail and track accessories. Even in this line there was more interest than for many months.

## Stainless Steel Boosted

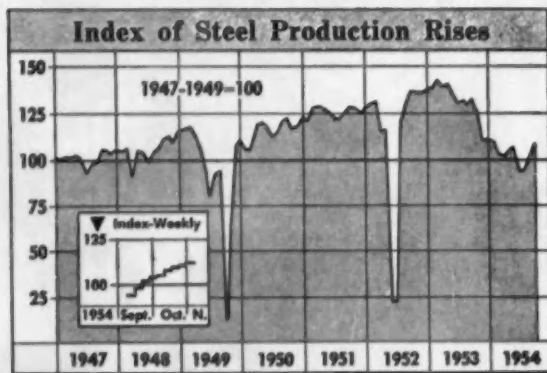
Prices of nickel stainless steel were increased in December by a modest two per cent, the first price change since June 1953. Neither alloy steel nor stainless prices were increased last summer when carbon steel was advanced following wage increase. At that time demand had slumped badly and competition forced makers to absorb the higher costs. The price advance was initiated by U. S. Steel, and was said to have been caused by the higher prices announced for nickel. Other makers of stainless products quickly followed suit.

It is well known that manufacturers of alloy and stainless steel encountered a much weaker market in

early 1954 than carbon steel makers, hence the pick-up was more marked. The operating rate for electric furnaces has risen faster than for open hearth.

## Scrap Demand Lessens

In spite of a sizzling steel market, demand for scrap is less and prices fell moderately from \$34 to \$32.17 per ton by mid-December for the fourth week in a row. Resumption of pig iron production by a number of blast furnaces has been a factor in holding down scrap prices. A few months ago there was great con-



cern in the industry over mounting exports of steel scrap, and the Government was urged to cut such exports. However, nothing developed from Washington, and the agitation for curbs has died down.

## Copper Supply to Remain Tight

Demand for copper continued strong through December, keeping pace with soaring steel demand. Kennecott Copper Corp., largest domestic producer, announced its Utah mines would go on a 7-day week basis because of insistent calls for metal. This should add about 3000 tons per month to normal domestic mine output of 70,000 tons.

Incoming business of the brass mills has improved in the fourth quarter, and operations are better than 70 per cent capacity. Ingot brass shipments increased to 24,000 tons a month, up 7000 tons from the low summer rate. The Chase Brass & Copper Company advanced its schedule of prices for its product to compensate for higher labor costs.

(Turn to page 99, please)



and still the figure grows...now

# 35

out of

# 37

engine manufacturers using chrome

rings specify



**Perfect Circle** piston

rings

The Standard of Comparison

This overwhelming preference by automotive engineers might be summed up in these few words:

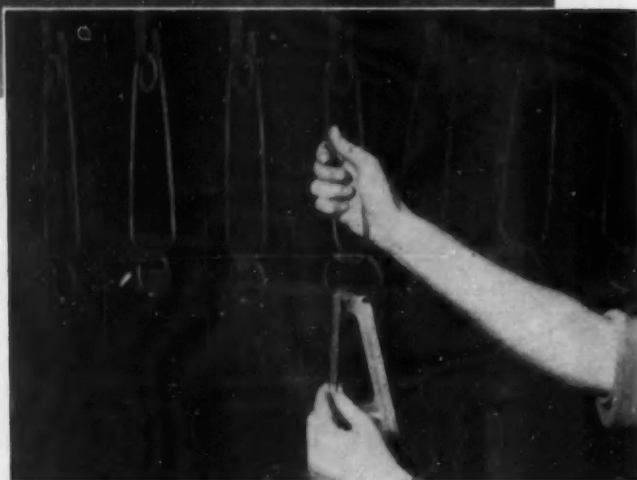
**1. Quality Control 2. Sound Engineering 3. Service 4. Experience 5. Proved Performance**

Perfect Circle Corporation, Hagerstown, Indiana • The Perfect Circle Co., Ltd., Toronto, Ontario



Leading jet aircraft parts on flow-coat paint conveyor at one of five loading stations in the sheet metal department of the Torrance facility, Douglas El Segundo.

## Jet Plane Parts on 2100-ft Paint Line Conveyor



Close-up of loading the Douglas-designed hooks that are spaced four inches apart on the continuous flow-coat paint conveyor.

**T**HE longest continuously moving paint line of its kind is in operation at the Torrance, Calif., plant of Douglas Aircraft Company's El Segundo Division. It has an electrically-driven overhead monorail system nearly half a mile long and can be operated at speeds of 10 to 30 fpm.

The conveyor dips into five different production locations to receive, without pausing, loadings of sheet metal airplane parts. At one point the conveyor travels underground into a 378-ft tunnel divided into chambers. Here the parts move through a dozen different automatic phases, such as washing, rinsing, drying and various chemical treatments.

The advanced-type painting system can accommodate parts a square inch in size to as long as six feet. They

are hung on squeeze-type loops suspended from hooks fixed at four-inch intervals along the roller chain of the 2100-ft steel monorail.

The system employs the principle of flow coating. At low-pressure the paint is slushed on the parts with a fan-like action from banks of nozzles on the sides and bottom of the processing chamber.

The flow-coater utilizes 30 to 40 gal of zinc chromate primer on the two eight-hour work shifts on which it is being operated at present. Agitation necessary in dip coating is supplied in the flow coating process when the paint is pumped from the sump to the nozzle banks.

If a fire should break out the system automatically  
(Turn to page 107, please)

## METALS

(Continued from page 96)

On the London Metal Exchange cash copper experienced another squeeze in mid-December which sent the price to 35½ cents less. This indicated the belief that the squeeze was temporary and lower prices would prevail in 1955. Yet 32½ cents for future copper in London was still substantially more than the 30 cent level doggedly maintained in New York since March 1953.

### Replenishing Inventories

At least some of demand for copper is tied up with inventory and tax problems of fabricators and consumers. To that extent it does not represent actual consumption. Because of shortages caused by strikes, many users had to dig into inventories of metal carried at much lower price levels than 30 cents a pound. If this low priced copper was not replaced at current prices before the end of the year, companies using LIFO accounting method would be faced with higher income taxes based on the difference between inventory cost and sales price of copper.

Such inventory buying will not be a feature in 1955, but quite likely will be replaced by purchases to repay the Government for metal diverted from the stockpile for consumer use when copper was desperately short. Latest figures from Washington indicate that 33,194 tons of refined copper were released to fabricators in dire need of metal with about 7600 tons remaining for hardship cases in December. All this metal must be returned to the Government before June 30.

### Foreign Consumption High

A feature of the 1954 copper picture was the well-sustained consumption of copper in Great Britain and on the Continent. In the United Kingdom, monthly consumption has averaged about 35,000 shown for West Germany and France.

Convincing proof of Europe's return to the copper market in a dominant way is seen in the lower imports received in the United States from abroad. During the January-September period net imports were 33,090 tons per month, compared with 46,600 tons in the 1953 period, a 30 per cent decline. During the same time

(Turn to page 101, please)

# There's no "...or equal" for EASY-FLO and SIL-FOS

EASY-FLO and SIL-FOS are the original low-temperature silver brazing alloys conceived and perfected by Handy & Harman metallurgists.

Years of research went into the development of the alloys and the manufacturing methods and quality controls used in their production. In composition, in physical properties and in unvarying uniformity, EASY-FLO and SIL-FOS alloys stand alone.

It is from these exclusive features that EASY-FLO and SIL-FOS alloys get their remarkably fast brazing action and ability to make high-strength, liquid and gas-tight joints, consistently and at surprisingly low cost. That's why there's no "or equal" for EASY-FLO and SIL-FOS alloys when it comes to fast, reliable, economical metal joining.

## and there's no "...or equal" for these SERVICES

The following technical and practical assistance is available, without cost or obligation, to all users of EASY-FLO and SIL-FOS alloys through Handy & Harman's engineering and research departments, field service staff and nearest distributor.

**DEMONSTRATIONS** of EASY-FLO and SIL-FOS silver brazing in your own shop.

**SURVEYS** of your metal joining to determine if and where EASY-FLO or SIL-FOS brazing can benefit you.

**DESIGN AID** for your engineers to assure best joint design for EASY-FLO or SIL-FOS brazing.

**SAMPLE BRAZING** of your parts by our technicians to determine the best way to silver braze them.

**PRODUCTION AID** to help work out the procedure that will give you the output you want at lowest cost.

**OPERATOR TRAINING** of your key men in our brazing schools, or by a program we set up in your plant.

**RESEARCH** in our laboratories to work out your special silver alloy brazing problems.

### SEND FOR THIS LIST AND BULLETIN



You can get the real EASY-FLO and SIL-FOS alloys, and their companion low-temperature HANDY FLUX, only from Handy & Harman Authorized Distributors. They're located in principal centers throughout the country. Write for the "Distributor List" and contact the nearest one.

**BULLETIN 20** contains the full facts about EASY-FLO and SIL-FOS. It makes

clear why these alloys are being used today, in tremendous quantities throughout all industry. It also includes useful information about joint design and fast brazing production methods. Write for a copy.



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# News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from Page 39

## Car Prices Remain Static Despite Steel Price Cut

The reduction in the price of steel in the Detroit area is not sufficient to justify a cut in car prices, automobile companies feel. Despite a \$1-a-ton decrease in the price of steel sheet and strip by several of the large steel companies, prices of the metal still remain about \$2 a ton higher in Detroit than in many other major steel consuming areas.

While car companies were pleased with the price cut because it reduces material costs, other steel producers took a dim view of the move started by National Steel Corp. They feel that it was unnecessary in view of general improvements in the steel and automobile businesses.

## Standard Tag Mountings On Cars Planned for '57

It is fairly definite now that the automobile industry will adopt standard license plate mountings on 1957 models. Fifty of the 65 North American jurisdictions have already agreed to adopt the new standard which specifies a six by 12-in. plate. There is a possibility that car manufacturers will make conversion kits available to remaining jurisdictions which do not go

along with the new standard.

The standard, adopted officially in October, 1953 by the American Association of Motor Vehicle Administrators, is not intended for trucks, which are allowed to mount license plates anywhere provided they are clearly visible and lighted.

## Former K-F Workers Lose Suit To Distribute Pension Fund

Denial of a court petition to former Kaiser Motors Corp. workers, who sought to have a \$6 million pension fund dissolved and distributed, has muffled possible repercussions which might have developed in the automobile industry. Had the K-F workers won the suit, it could have paved the way for similar action against other companies which have made shifts in employment as a result of consolidation.

The suit was filed last July by some 350 former K-F workers who lost their jobs when Kaiser merged with Willys, and a large percentage lost their accumulated pension credits. Altogether, approximately 10,000 one-time Kaiser workers would have been involved. The court ruled, however, that the Kaiser-UAW agreement specifically prohibited such a breakup of the pension fund started in 1949.

The fund's trustees have assured the workers that they would be paid any benefits entitled them when they reach the retirement age of 65.

## Plymouth Pushing To Bump Buick Out of Third Spot

Shooting to regain the third place it lost to Buick last year, Plymouth Div. of Chrysler Corp. starts the year off with the fastest production pace in its long history. A threatened strike was averted last month at the Detroit plant which would have dealt a serious blow to production. To meet a reported heavy demand, Plymouth now looks to 1955 as a banner year.

Had the aforementioned strike taken place, it could have cut off close to 70 per cent of the division's total production. However, settling of several issues between the union local and the division has paved the way for Plymouth to recapture its former share of the market.

Provided that parts supplies remain available, Plymouth hopes to remain at near peak production capacity for some months. It has been turning out 3400 cars a day, six days a week.

During the current competitive battle in the automobile industry, other car manufacturers continue, almost week by week, to report new production records. Oldsmobile, on Dec. 7, established a new annual production record of 400,000 cars.

Ford, on Dec. 8, set a new postwar single-day production high of 7310 cars and trucks, and total production for the year up to that date was recorded at 1,564,407 vehicles.

## WEST SOUTH CENTRAL AREA ONLY ONE TO SURPASS 1953 IN 10 MONTHS

### Regional Sales of New Passenger Cars

Zone	Region	October 1954	September 1954	October 1953	Ten Months		Per Cent Change		
					1954	1953	Oct. over September	Oct. over Oct. 1953	Ten Months 1954 over 1953
1	New England	24,280	24,660	31,422	275,696	282,493	- 1.16	-22.73	- 2.05
2	Middle Atlantic	77,905	77,333	103,949	802,594	846,982	+ .22	-25.54	- 6.80
3	South Atlantic	45,074	46,718	69,297	533,960	554,290	- 8.42	-24.11	- 3.74
4	East North Central	61,688	106,387	137,589	1,162,024	1,281,596	- 8.70	-33.43	-10.88
5	East South Central	21,926	21,350	24,237	225,850	229,295	+ 2.70	- 9.54	- 1.49
6	West North Central	37,497	39,609	44,400	445,674	489,235	- 6.33	-15.55	- 9.30
7	West South Central	39,803	40,751	40,004	438,061	435,009	- 2.33	- 1.97	+ .82
8	Mountain	16,190	13,936	15,175	140,790	154,902	+ 9.77	- .11	- 8.87
9	Pacific	43,042	40,694	47,624	441,387	503,539	+ 6.77	-10.00	-12.34
	Location Not Determinable				1,782				
	Total—United States	395,943	407,644	504,697	4,829,624	4,874,741	- 2.92	-21.85	- 7.10

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. C., Fla., Ga., Md., N.C., S.C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn.

Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Cal., Ore., Wash.



(Continued from page 99)

refined stocks of copper held abroad fell over 100,000 tons. Production on the other hand, was larger than in 1953. Obviously Europe took all the increase, and foreign producers did not find it necessary to offer their metal to this country as freely as they had in earlier years.

### Improved Zinc Figures

The American Zinc Institute released more cheerful statistics on the zinc industry for November, but the long expected price increase was not forthcoming. Apparently plenty of metal was readily available at 11½ cents a pound, East St. Louis, or 12 cents New York. Zinc futures on the Commodity Exchange were offered about one cent lower than spot.

Yet the November figures gave considerable cause for optimism. During the month deliveries totalled 97,600 tons, the largest monthly shipments for over seven years. Smelter production climbed 13,000 tons to over 80,000 tons, but this represented extra output from large stocks of concentrates accumulated during a strike at the Montana Smelters. Slab production in December will be sharply lower than in November.

Stocks of slab zinc in the hands of smelters dropped for the sixth consecutive month to 134,600 tons at the end of November, lowest since August 1953, and 75,000 tons lower than in June 1954 when they totalled 209,800 tons.

The Government took 15,500 tons for the stockpile, against 10,000 tons in October. If the announced objective of 300,000 tons by June 30 is to be attained, the buying rate must be increased.

### Die Casters in the Market

Demand for Special High Grade for die casting purposes has been good, helped substantially by the fast pace of the automobile industry. Shipments have increased but unfilled orders have increased even faster. Recently the American Zinc Institute has joined forces with the Die Casting Association to sell more die castings to industry, without specifying they should be made of any special metal. To further this idea, a new color and sound motion picture "Die Casting—How Else Would You Make It?" has been released for exhibition throughout the country. The respective advantages of zinc, aluminum, magnesium, and brass for die casting

(Turn to page 105, please)

## THOMSON NYLINED<sup>®</sup> BEARINGS



...with Smooth, Tough,  
DuPont NYLON!

### ... OFFER YOU THESE IMPORTANT BENEFITS

- |                   |                         |                         |
|-------------------|-------------------------|-------------------------|
| • LOWER COST      | • RESIST CORROSION      | • LIGHTEST WEIGHT       |
| • NO LUBRICATION  | • EASILY INSTALLED      | • NON-CONTAMINATING     |
| • MINIMUM SPACE   | • DAMP VIBRATION        | • LESS MAINTENANCE      |
| • CLOSE FIT       | • OPERATE IN LIQUIDS    | • SELF-RETAINING        |
| • RESIST POUNDOUT | • NO FRICTION OXIDATION | • INSTANTLY REPLACEABLE |
| • RESIST ABRASION | • LOW FRICTION • SILENT | • LONGER LIFE           |

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NYLINED Bearings are a highly engineered thin liner of Dupont Nylon, designed to bring bearing users the many benefits of Nylon as a bearing material by solving most of the limitations surrounding its use. The compensation gap principle assures maintenance of diametral tolerances for precision applications.

Available in 4 standard types, 10 standard sizes... from stock. Other types and sizes may be inexpensively tooled for production applications. For catalog containing data on advantages, applications, standard sizes, prices, special types, load ratings, engineering information, evaluation chart, installation methods... write to

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Also—Manufacturers of BALL BUSHINGS... the Ball Bearing for Linear Motions

## **AUTOMATION NEWS REPORT**

*(Continued from page 51)*

ciples through devices of varying complexity for the accomplishment of a desired result. . . . These devices operate through certain functions of the process itself, such as temperature, pressure, flow, time cycle, physical characteristics and product quality."

### **APPLYING AUTOMATION**

Even at Ford, said Mr. Harder, there is difficulty sometimes in selling manufacturing engineers on the advantages of automation. Although starting out as a centralized function, it has been decentralized. There are automation engineers in the manufacturing engineering department of each Ford plant.

At Sun Oil Co., said Mr. Barton, the various branches are so diversified that a coordinating committee was set up to promote the interchange of ideas. Automation reaches into research, operation, engineering, quality control, measurement and accounting, he explained.

Several sessions of the recent annual meeting of the ASME (see page 68) emphasized good automation design. Discussing the history and the future of transfer machines, M. O. Cross, president of The Cross Co., told how recent developments can hold down time for tool changes to five per cent of production time. K. O. Tech of Cross explained at another session that controlling the two kinds of down time is the key to success. Predictable down time for tool change, cleaning, etc., is minimized by proper scheduling. Nonpredictable down time, however, is due to breakdowns and results in most cases from poor design. Mr. Tech discussed chip removal, coolant systems, trip adjustments, cleanliness, hydraulic leaks, valve mountings, cylinder, and electrical controls specifically. Leaks seem to be the paramount problem at the moment. Manifolding of hydraulic components in place of threaded fittings, and sealing with "O" rings is going to be the solution, he said.

Automation today is a basic engineering science, F. R. Swanson of Sundstrand Machine Tool Co., remarked at the same session. Specifically, he emphasized automatic lubrication of heads and ways, with signals to indicate failures. Fail-safe circuits are more important than

circuits with the minimum of components. Electrically controlled mechanical units are preferred to maintain a definite chip per tooth load on cutting tools or an accurate time cycle. Hydraulic control is better for faster operations, such as six cycles or more per minute.

A practical set of design rules for transfer machines was listed in the paper by J. H. Mansfield, of Greenlee Brothers & Co., presented at this session. He drew on the experience of nearly 20 years of building transfer machines to cover dependability, safety features, fixtures, tool holders, spindles and heads, feed units, and controls.

## **Aircraft Industry Activities**

*(Continued from page 53)*

end it is expected that employment will be on the order of 785,000 to 790,000, and that employment for the year will average slightly more than 800,000. Counting the employees of subcontractors and suppliers, the total aircraft production work force is estimated at well over 1,000,000.

A comparison of the top five industrial employers (based on reports of the Bureau of Labor Statistics) places average aircraft employment for the period January through September, 1954, at 811,000; followed by the automobile industry with 740,500; steel mills, rolling mills and blast furnaces with 583,900; communication equipment with 495,500; and manufacturers of cotton and rayon fabrics with 484,800.

### **Avro Canada Diversifies Production Organization**

Canada's largest defense aircraft producer—A. V. Roe Canada, Ltd.—has taken a big step toward a more versatile career as a producer of both civilian and defense goods. It is becoming a three-company group by splitting its present operations into two and acquiring outright a third company, Canadian Steel Improvement, Ltd.

Split into two parts are Avro Aircraft Ltd., and Orenda Engines Ltd., which now employ about 16,000 persons at a 550-acre site at Malton, Ont. With the addition of Canadian Steel Improvements Ltd., producer of precision forgings, the company will be in a better position to vary and extend its production.



*(Continued from page 37)*

Directors of Gleaner Harvester Co. have approved the sale of the farm implement manufacturing concern to Allis-Chalmers Mfg. Co., subject to stockholder approval.

Westinghouse Electric Corp. has announced plans to build new research and development facilities costing over \$12.5 million at its Kansas City, Mo., jet engine plant.

American Locomotive Co. has been awarded a Government contract to build and test a prototype package atomic powerplant for military use.

International Harvester Co. has introduced its new 140-hp Black Diamond gasoline engine as optional equipment for the R-160 Series Truck models.

Lear, Inc., has purchased the design and manufacturing rights to all hydraulic and pneumatic servo systems and components of Auto-Control Laboratories.

Fairchild Engine & Airplane Corp. has purchased the military business of Kendall Controls Corp. The latter is a manufacturer of pneumatic valves and control devices.

Valentine Metals Corp. is name of a new company formed to manufacture a line of cemented tungsten carbide tools and blanks. It will be located at 31100 Stephenson Highway, Royal Oak, Mich.

American Foundrymen's Society is now located in its new quarters at Golf and Wolf Roads, Des Plaines, Ill. . . . American Welding Society has formed a technical council to coordinate its varied technical activities.

Navy Dept. has developed a pneumatic angle drive reduction gear with a 212 to 1 ratio. Producing a drive with a spindle speed of 10-20 rpm, the new device is substituted for normal spindle of a corner drill.



PROPERTY AND APPLICATION DATA ON THESE  
VERSATILE ENGINEERING MATERIALS: "ZYTEL,"  
"ALATHON," "TEFLON," "LUCITE."

# NEWS

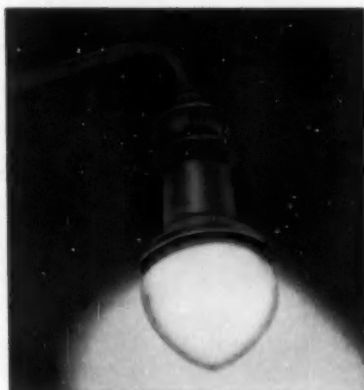
NO. 1

1955

## "Zytel"\* Nylon Resin Gives Toughness, Abrasion Resistance, Economy to Auto Parts

### Du Pont LUCITE® offers many advantages for lighting fixtures

Breakage is a common problem with street-light fixtures. Glaring street lamps and the absence of auxiliary road lighting increase the hazards of night driving. Safety of the pedestrian on well lighted streets is assured by the use of this globe of "Lucite" acrylic resin. These globes are non-shatterable, which helps eliminate high replacement costs. They are



Street-light globes like these exhibit the same long service life and outdoor weatherability as do the lighting fixtures of "Lucite" found in the modern-day automobile. Globes are molded of Du Pont "Lucite" by the Colt's Manufacturing Company, Hartford, Connecticut.

easy to clean, and resist discoloration and other weathering effects. After two years' exposure to sun and moisture, these globes of Du Pont "Lucite" are of excellent whiteness, and efficiently transmit glare-free light.

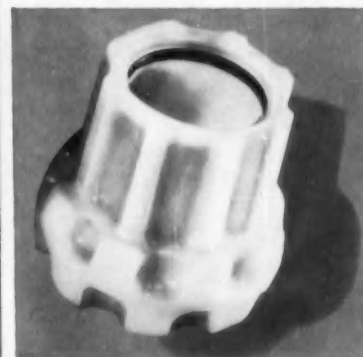
Some of these same properties of "Lucite" are widely used in automotive lighting fixtures. Beautiful fixtures of "Lucite" help the designer in styling his modern automobile. Headlights, back-up lights, parking lights—as well as medallions and panels on the instrument panel—all utilize the decorative and functional properties of this unique engineering material. For more information on Du Pont "Lucite" acrylic resin, use the coupon on the other side of this page.

### Du Pont "Zytel" is specified for diversified automotive uses

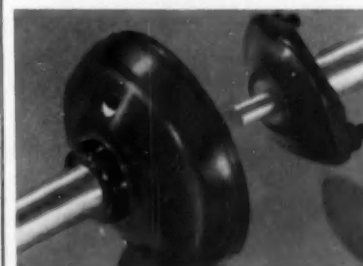
Since Du Pont "Zytel" nylon resin was introduced in the automotive field, engineers have been finding more and more new ways to use this versatile material. Its properties are impressive. "Zytel" is tough, and has good resistance to heat, abrasion, fatigue, and hydraulic fluids. It has excellent bearing characteristics and quietness in operation. The parts produced seldom need any finishing operation and a single piece of "Zytel" can frequently replace an entire assembly. This combination of properties and ease of working make Du Pont "Zytel" useful in many diverse automotive applications. Throughout the modern automobile, parts once made of conventional materials are now molded of "Zytel" nylon resin. For example:



This gear, readily molded of "Zytel" is exceptionally abrasion-resistant. It operates quietly because Du Pont "Zytel" nylon resin damps noise and vibration, absorbs shock, requires little or no lubrication.



A bushing molded of Du Pont "Zytel" nylon resin, which solved a wear and lubrication problem on the brake camshaft of heavy-duty trucks. "Zytel" needs little or no oiling, operates continuously to 250°F., is not affected by freezing temperatures.



This electric speedometer adapter of Du Pont "Zytel" provides sure insulation and responds quickly to speed changes of the axle. These parts are lightweight, resist wear and chipping.

#### Gears and Bushings

Gears made of Du Pont "Zytel" nylon resin have many light-load applications. They offer long service life, quiet operation, heat-resistance and the ability to work quietly and efficiently with little or no lubrication.

Nylon bushings operate quietly and are normally unaffected by moisture or dirt. They can operate with little or no lubrication, being especially useful in those hard-to-reach places in the automobile or truck where lubrication is often scanty or overlooked.

#### Insulating Parts

Du Pont "Zytel" has good dielectric properties. Insulating parts of nylon include fuse holders, line connectors, tail-lamp plugs, and the various insulating grommets and sleeves found on generators, starters, distributors and horns.

Other automotive uses for "Zytel" include dome-light lenses, flexible rods for raising radio antennas and parts for air-conditioning equipment and automatic starters. For complete information about "Zytel", mail the coupon on the back of this page. It may be that this unique engineering material will help you solve your automotive design problems.

\*"Zytel" is the new trade-mark for Du Pont nylon resin.

OVER





# AUTOMOTIVE ENGINEERING

# NEWS

PROPERTY AND APPLICATION DATA ON THESE  
VERSATILE ENGINEERING MATERIALS: "ZYTEL,"  
"ALATHON," "TEFLON," "LUCITE."

NO. 1

1955

## Speedy splicing with connectors of "Zytel"

Splicing and wire connectors insulated with "Zytel" nylon resin offer high electrical protection and temperature resistance to 105°C. (maximum UL



Wires are inserted in connector of molded Du Pont "Zytel" nylon and then trimmed. Connectors are manufactured by Buck Electrical Manufacturing Co., Roselle, New Jersey.



Sealing cap is screwed over crimped connector to complete a safe, compact splice. Connectors are molded by the Nylon Molding Corporation, Garwood, New Jersey.

listing). Called "Nycaps", these connectors easily passed the pull-out test by UL, the manufacturer reports. Threads molded of "Zytel" give vibration-proof locking and sealing action. To splice, the connector cap is removed and stripped, twisted wire ends are inserted through the open-ended splicing sleeve, crimped, and trimmed. The cap is then screwed back on.

"Zytel" gives excellent electrical insulation in thin, lightweight sections. Its corrosion resistance makes it an outstanding dielectric material for automotive wiring systems.

## Bearings of TEFLON® offer many advantages

Properties of "Teflon" tetrafluoroethylene resin offer new solutions to bearing design problems in the automotive field. "Teflon" is self-lubricating and has an exceedingly low coefficient of friction. Its mechanical strength is high and it is tough and flexible at temperatures from -450°F. to 500°F.

"Teflon" has excellent abrasion resistance. In one test, bearings of "Teflon" were still in satisfactory condition after 1,000 hours' operation with 20 p.s.i. projected area load at 1,500 r.p.m. An important quality of "Teflon" to the automotive industry is that foreign particles tend to work their way into the "Teflon" and do not score the shaft.

"Teflon" is inert to all chemicals and solvents normally encountered in industry. Its water absorption is zero by ASTM test D570-42.

## Investigate Du Pont engineering materials in your product development programs

One of the family of these versatile engineering materials is often a key factor in product improvement or new product design.

The wide range of properties available with "Alathon"® polyethylene resin, "Lucite"® acrylic resin, "Teflon"® tetrafluoroethylene resin, and "Zytel"® nylon resin are helping solve industrial design problems.

### NEED MORE INFORMATION?

Clip the coupon for additional data on the properties and applications of these Du Pont engineering materials.

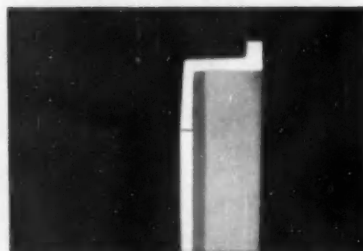
## Strip of ALATHON® makes removal of zinc deposit from cathode easy

Versatile "Alathon" polyethylene resin has a wide variety of properties which industries can utilize to meet specific problems. Take, for example, the cathode



Cathodes which collect zinc are shown here on the stripping rack. Four cathodes at left have strong, flexible, corrosion-resistant strips of Du Pont "Alathon" polyethylene resin, which simplify removal of zinc.

strip of "Alathon" illustrated below. This strip separates zinc plated on aluminum cathodes from the cathode so the zinc deposits can be removed easily. "Alathon" is impervious to the action of the zinc sulfate solution which caused other strip material to swell and rot. Now, however, with strips of Du Pont "Alathon", failure of the cathode strips is eliminated. The flexibility of "Alathon" permits a tight snap fit on the edge of the cathode.



Close-up of edge of a cathode showing how strip of Du Pont "Alathon" fits tightly.

Where is "Alathon" used in the automotive industry? One manufacturer takes advantage of the corrosion-resistance, toughness and flexibility of "Alathon" for battery sealers and tubes. Another coats wire and cable with "Alathon", which is lightweight and has excellent dielectric properties. How can Du Pont "Alathon" help you? Use the coupon at left for more information.

E. I. DU PONT DE NEMOURS & CO. (INC.)  
Polychemicals Department  
Room 171, Du Pont Building, Wilmington 98, Delaware

Please send me more information on the Du Pont engineering materials checked:  
☐ "Zytel"; ☐ "Alathon"; ☐ "Teflon"; ☐ "Lucite". I am interested in evaluating these materials for:

NAME \_\_\_\_\_ POSITION \_\_\_\_\_  
COMPANY \_\_\_\_\_  
STREET ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ STATE \_\_\_\_\_  
TYPE OF BUSINESS \_\_\_\_\_

"Alathon", "Lucite", "Teflon" are registered trade-marks of E. I. du Pont de Nemours & Co. (Inc.)  
"Zytel" is the new trade-mark for Du Pont nylon resin.



# METALS

(Continued from page 101)

are pointed out without prejudice. Die casters have evinced great interest in the program.

## Additional Protection Urged for Lead and Zinc

The National Lead and Zinc Committee declared that the Government's stockpiling program had failed to maintain a strong domestic lead and zinc mining industry and urged additional protection with a higher import duty on both metals. While lead miners have less cause for complaint with their metal apparently firmly entrenched at 15 cents a pound, zinc producers have ended up another unsatisfactory year.

Nevertheless, there is little reason to expect that higher tariffs will be voted in Congress. For zinc a substantially higher price than the present appears to be of doubtful long term benefit. Foreign imports could be shut off or curtailed by a higher tariff but only at the cost of arousing bitter animosity from producers in Canada, Mexico, and South America. Quite as important is the likelihood that zinc might price itself out of the market to competing metals, and arouse hostility from its important customers because of too frequent price changes.

## Higher Price for Nickel, Lower for Titanium

The International Nickel Co. raised the nickel price 4½ cents a pound, to offset higher production costs. The trade regarded the increase as moderate. It was not expected to affect demand for nickel, at present in scarce supply.

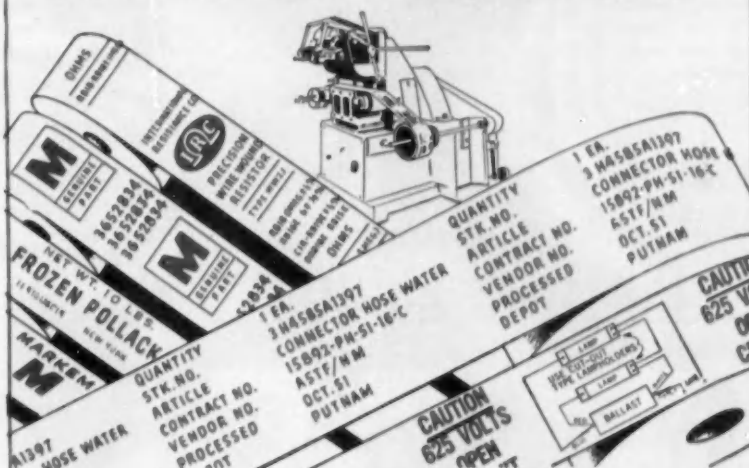
However, it appears likely that the shortage will be relieved later in 1955 when increased production from new mines in Canada and the U. S. will be available. Even more important to the nickel supply picture is an agreement between Washington and Freeport Sulphur Co. for the construction and operation of a pilot plant to beneficiate Cuban nickel deposits, with a future annual output of 15,000 tons. By 1956 it is estimated the United States will obtain at least 10 per cent of its needs from domestic sources.

(Turn to page 106, please)

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### PRINTING LABELS ON PRESSURE SENSITIVE TAPE



The introduction of pressure sensitive tape for industrial uses offered many advantages if label data could be printed on the tape *in the plant itself when needed*. Markem developed methods that permit printing of stock number, part number, trade mark or other designation on this tape. Label inventory problems are thus eliminated. Manufacturers can now print the exact number of labels required... readily changing variable information or color of ink when desired. The Markem method used includes a Markem machine which makes up to 85 imprints per minute, rewinds the roll of tape automatically, and shuts itself off after a selected number of imprints. Thus Markem has provided industries of all types with a more modern, more attractive and less expensive means of labeling.

# MARKEM

## MARKS THEM ALL

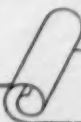


### CAN MARKEM HELP YOU?

Printing labels on pressure sensitive tape is but an example of how Markem solves industry's marking problems. Markem has been providing industry with production techniques and equipment to identify, decorate or designate its products, parts and packages since 1911. Markem also provides technically trained men who are available in your area to assure continued satisfaction with Markem methods and equipment.

When you have a marking problem, tell us about it and send a sample of the item to be marked. Perhaps a complete Markem method has already been developed to solve your problem. If not, Markem will work out a practical solution.

Markem Machine Company, Keene 8, N. H., U. S. A.



# MARKEM

... TO MAKE YOUR MARK

## METALS

(Continued from page 105)

At present domestic output of nickel is almost negligible.

The second reduction in the price of titanium sponge during 1954 was announced by DuPont, who lowered the base price 22 cents a pound, making the top grade available at \$4.50 and the lower grade at \$4. At the beginning of the year the price was \$5. Prices for titanium sheets ap-

proximate \$19.50 per pound, with bars quoted \$9.50. Progress has been slow in developing a cheaper process than the Kroll method for recovering the metal. Because of its high cost, industry has found little use for titanium metal but an immense market awaits a really substantial cost reduction. Further price cuts may be seen in 1955. At present, only about one per cent of titanium ores is used in manufacture of alloys and carbides, although the big future appears to be in their use. The most commonly used alloy now consists of

four per cent aluminum, four per cent magnesium, and 92 per cent titanium.

## Tungsten Producers Worried

Domestic tungsten miners have been enjoying a fixed Government price of \$63 per short ton unit of tungsten concentrates, while foreign producers have seen their price drop dismally below \$20. It has now recovered to \$27. It is doubtful if a single domestic mine could operate at this price.

As originally set up, the Government planned to buy domestic-mined tungsten until July 1958, or until it had accumulated 3 million units, whichever came first. By July 1954, nearly 1,000,000 units had been bought, and production, enormously stimulated by the high price, was exceeding 750,000 units annually. Probably the objective of 3 million units will be reached in 1956, or two years earlier than expected.

It appears very unlikely that Washington will continue to pay twice the world's price for tungsten indefinitely. Domestic producers are hoping to get \$40-\$50 per unit in order to keep the industry alive.

## Aircooled Automotive Diesels

(Continued from page 92)

either side. Pressure lubrication from a gear-type pump reaches the camshafts, crankshaft, connecting-rod bearings, timing gear and valve rockers.

The ribbed, cast-iron crankcase supports the V-8 crankshaft in five main bearings, the V-6 in four. Exhaust manifolds are arranged for discharge at either end. There are two oil-bath air cleaners. Cold starting is by a 24-volt motor.

Weights of the two units are 1600 lb and 1900 lb. Both are 2 ft, 9 1/2 in. high and 3 ft, 10 1/2 in. wide, while the V-6 is 3 ft, 4 7/16 in. long and the V-8 3 ft, 11 1/2 in.

These engines were developed by Petters, Ltd., and are designated as Petter-McLaren PDV6 and PDV8. It is understood that at least one British manufacturer of commercial vehicles is considering their use.

Other new air-cooled Diesels in this series are of in-line construction but use the maximum number of interchangeable parts. They are of two, three and four cylinders also rated at 12 hp per cylinder.

## Highest Precision HARDENED & GROUND PARTS

**T**HE ball stud shown here is a perfect example of the precision methods and quality material that go into the production of all Brown Hardened and Ground Parts. Twelve separate operations are employed to produce this vital part. Every feature about this ball stud has to be right—every feature is. It has strength, wear resistance, precision fit, true-ground spherical and tapered surfaces, close inspection and strict uniformity.

Brown Hardened and Ground Parts have been serving the automotive industry for over 40 years. We refer you to any of our long list of satisfied customers. For information pertaining to your own requirements, simply write or wire.

*Henry W. Brown*  
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Parts Include  
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## Jet Plane Paint Line

(Continued from page 98)

stops, all fans and blowers halt, the paint flow turns off, and heat sources are killed. At the same time carbon dioxide discharges into sumps and all closed drains.

In operation a shop work order is enclosed in a tube and hung on the conveyor line. Parts are hooked on from any one of the five loading stations by employees. The monorail curves sharply upward as it leaves a loading station to afford work space underneath. Overhead the line is safety guarded by screens to protect personnel working below.

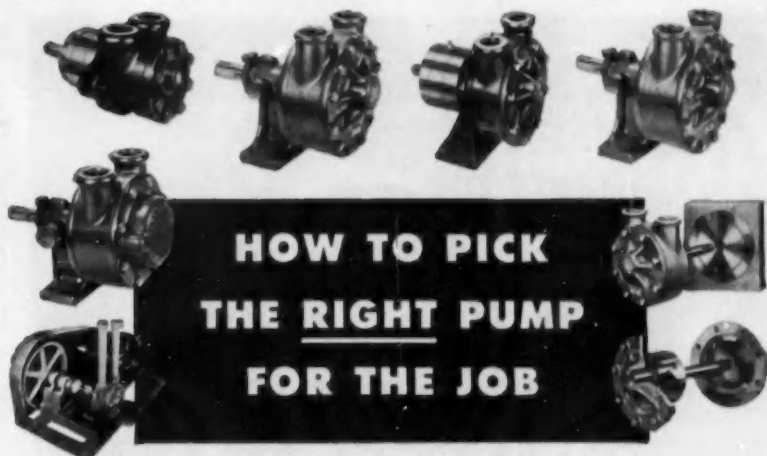
The following lists in detail each step parts undergo after entering processing chambers:

1. Alkaline spray cleaner (American Chemical's Ridoline No. 46 with Ridosal No. 71 as wetting agent).
2. Hot water rinse.
3. Cold water rinse.
4. Alodine No. 1200 (American Chemical Co.).
5. Rinse.
6. Hot chromic acid (dilute solution Alodine No. 1200).
7. Through 60-ft oven served by blowers.
8. Cold air blast.
9. Flow coat booth. A complete absence of atomized action due to low pressure and specially designed nozzles.
10. Rise to first floor level elevated position where drying oven maintains 190 F. This heat automatically shuts off whenever line stops because temperature must not be built up, it being too close to annealing limits.
11. Line next dips to central unloading area where parts are inspected and distributed to assembly or to stock along with work order.
12. The line then rises to overhead stripping chamber where hooks are cleaned of accumulated primer before continuing into the loading sequence.

The flow coat paint system is a product of Industrial Systems, Inc.

The paint system will be used to process parts for the Navy's F4D Skyray jet interceptor and other combat craft now on order for the sea-going service.

*Readers of  
AUTOMOTIVE INDUSTRIES  
are always well informed*



## HOW TO PICK THE RIGHT PUMP FOR THE JOB

## TUTHILL Simplifies Pump Selection for PRODUCT DESIGNERS

To make it easy for product designers to select the right oil pump for the job, Tuthill offers new catalog data covering pump models to meet the specific pumping purposes outlined below. Each

catalog features an individual pump guide so you can select the exact pump to fit your need. Check the following services and ask for the Tuthill catalogs you wish by Catalog number indicated.

### For PRESSURE LUBRICATION

		Catalog No.
Model L	1/4 to 6 g.p.m. up to 200 p.s.i.	101
Model C	2 to 200 g.p.m. up to 100 p.s.i.	102
Model R	3/4 to 200 g.p.m. up to 100 p.s.i.	105
Models S & SA	1/4 to 200 g.p.m. up to 200 p.s.i.	106

### For HYDRAULIC SERVICE

		Catalog No.
Model L	1/4 to 6 g.p.m. up to 600 p.s.i.	101
Model CK	5 to 200 g.p.m. up to 400 p.s.i.	103
Model R	3/4 to 200 g.p.m. up to 400 p.s.i.	105
Models S & SA	1/4 to 200 g.p.m. up to 200 p.s.i.	106

### For COOLANT SERVICE

		Catalog No.
Model C	2 to 200 g.p.m. up to 100 p.s.i.	102
Model CK	100 to 200 g.p.m. up to 200 p.s.i.	103
Model M	2 to 50 g.p.m. up to 15 p.s.i.	104
Model R	2 to 200 g.p.m. up to 100 p.s.i.	105
Models S & SA	2 to 200 g.p.m. up to 200 p.s.i.	106

### For TRANSFER AND CIRCULATING

		Catalog No.
Model L	1/4 to 6 g.p.m. up to 200 p.s.i.	101
Model C	2 to 200 g.p.m. up to 100 p.s.i.	102
Model CK	100 to 200 g.p.m. up to 200 p.s.i.	103
Model R	2 to 200 g.p.m. up to 100 p.s.i.	105
Models S & SA	2 to 200 g.p.m. up to 100 p.s.i.	106

### For BURNING OILS

		Catalog No.
Model L	1/4 to 6 g.p.m. up to 200 p.s.i.	101
Model C	2 to 50 g.p.m. up to 100 p.s.i.	102
Type SU	2 to 50 g.p.m. up to 300 p.s.i.	107

### For BUILT-IN APPLICATIONS

All standard Tuthill Pump models are available in stripped form for building into the design of your equipment. Ask for Catalog No. 106.

## TUTHILL PUMP COMPANY

Dependable Rotary Pumps since 1927

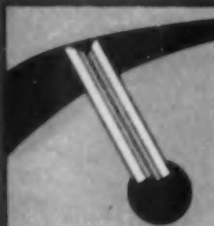
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Canadian Affiliate: Ingersoll Machine & Tool Co., Ltd.  
Ingersoll, Ontario, Canada



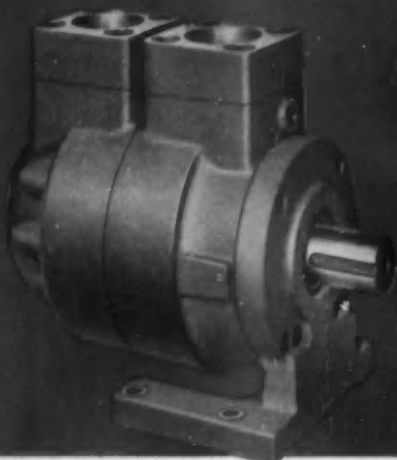


## Brute Strength or Delicate Handling of Rotary Power Functions . . .



### TWO VANES ARE BETTER THAN ONE

The hydraulically balanced DUAL-VANE in DUDCO Fluid Motors, as contrasted with conventional designs, maintain MULTIPLE AREAS OF CONTACT ON THE CAM RING . . . doubling the number of effective barriers to slippage and power loss. This patented principle is an exclusive DUDCO feature!



# DUDCO FLUID MOTORS

Compact and sturdy, DUDCO DUAL-VANE Fluid Motors operate quietly and smoothly under the most strenuous conditions. They're built to "take it" . . . frequent reversals, rapid accelerations or stalling under load. With DUDCO you get the big advantage of 2000 psi operation at a cost comparable with that of lower pressure equipment.

DUDCO is a big, exciting story for every hydraulics engineer because . . . power losses are minimized and operating efficiency is higher . . . starting torques are high . . . operation is smooth, quiet and exceptionally free from wear or maintenance problems.



On Conveyor systems for agricultural, feed processing, mining and other industries, DUDCO DUAL-VANE Fluid Motors provide the extras in performance that save time, money and labor. Operating



the winches on a giant tank retriever and other large mobile equipment calls for high starting torque and the dependable power of DUDCO DUAL-VANE MOTORS.

Write for Bulletin DM-301 fully describing  
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**DUDCO** DIVISION  
THE NEW YORK AIR BRAKE COMPANY  
1705 EAST NINE MILE ROAD • HAZEL PARK • MICH.



## Packards and Clippers

(Continued from page 58)

comprising individual exhaust pipe, muffler, resonator, and tail pipe on each bank. The tail pipe in this instance terminates at an outlet in each end of the rear bumper bar.

The cooling system consists of a tube-and-fin type radiator, centrifugal water pump, plate type unit transmission lube cooler, and capsule type thermostat. The new radiator core has a square, broad frontal area and features tanks of lock seam joint construction. The water pump has a single outlet but discharges into an equalizing outlet manifold with dual outlets, feeding a balanced flow to each bank. Coolant is returned to the radiator through an outlet at the forward end of the cylinder heads, the outlet being cast integrally with the pump body.

Full pressure lubrication is supplied to all vital moving parts, the oil supply being carried in an oil pan of five-qt capacity. Lubrication is from a gear type oil pump driven by the distributor shaft gear. Lubricant cleanliness is protected by an externally-mounted by-pass type oil filter, standard on Packard, extra on other models.

A special rotor vane vacuum pump is located on the lower end of the oil pump, driven by the oil pump shaft. A diaphragm type fuel pump is located at the right forward end, mounted on the timing chain cover and driven from the eccentric at the forward end of the camshaft.

As mentioned earlier, the entire line has been equipped with 12-volt ignition not only to meet the requirements of an increasing electrical load but to supply a sufficiently fat, hot spark for igniting the highly compressed mixture. The 12-volt generator is rated at 480-watt maximum, generator cut-in speed being lowered as well to maintain the electrical load even at low speeds. It is of two-brush, shunt wound type, with full external regulator control, air cooled by a fan mounted on the drive pulley. The battery is located at the left front end of the engine compartment, in a battery support on the left front fender splash. Starting motors are of four-brush, four-pole type with compound wound field. On Clipper Custom line and Packard models, starting engagement is by means of an over-running clutch drive; on Clipper Super and Deluxe models, engagement is by means of a follow-through Bendix drive with provision to prevent disengagement on false starts.

The distributor is of single breaker type with two advance mechanisms—vacuum and centrifugal.



## 1955 Automotive Picture

(Continued from page 46)

and confidence by business firms and consumers that the future prospects were bright enough to warrant maintenance of their high-level spending. The combined result of these actions was to produce an increase in total personal income after taxes in 1954 and to hold the decline in aggregate corporate profits after taxes to 10 per cent from the first half of 1953 levels. Some individuals and corporations suffered sharp drops in income, but the others in the aggregate have more buying power today than in the first half of 1953.

### Increased Activity

The two factors largely responsible for the decline in business activity after mid-1953 have now run their course. Defense expenditures in the third quarter of 1954 were down to a rate slightly below the average rate projected in the September budget revision for the fiscal year ending June 30, 1955. Business inventories were liquidated at an annual rate of \$4 billion in the first half of 1954 and \$4.8 billion in the third quarter. By the end of September, business inventories of durable goods were down to the point where liquidation could slacken and possibly cease. The resulting boost in orders received by durable goods manufacturers has been an important factor in the fourth quarter rise in business activity.

The only factor currently operating on the negative side is business expenditures for new plant and equipment. The leveling off in profits after taxes, high depreciation allowances, development of new products and geographical areas, and striving for maximum productive efficiency, however, will combine to hold business capital expenditures close to current rates.

### Positive Factors

In the absence of negative forces in the economy, the positive factors can operate to produce an increase in aggregate business activity. Cessation of inventory liquidation will provide a \$4.8 billion lift to the economy. State and local government expenditures for schools and highways are likely to increase further. Consumer spending for non-

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These famous Gear Type Motors operate with pressures up to 1500 psi. Available in flange or foot-mounted models, in a complete range of sizes to 52 hp. They feature the exclusive HYDRECO Four Bolt design which places greatest strength in the area of greatest pressure.

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You find the answers to so many problems in the wide experience of HYDRECO engineers... especially where a function involves rotary motion. Powering the sweeper or the snow blower on municipal equipment, driving conveyor belts on trenchers, or shaking walnuts out of the trees at harvest time... these are but a few of hundreds of money-saving operations HYDRECO Fluid Motors are called upon to perform.

HYDRECO Fluid Motors, with their high starting torque, instant reversibility, and capacity for handling rugged and seemingly impossible assignments, are the natural choice of design engineers. HYDRECO dependability stems from the fundamentally sound "Pressure-Balanced" design, unmatched craftsmanship and the "know-how" of thousands of outstanding hydraulic applications.

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HYDRECO Hydraulic Pumps, Motors,  
Valves and Cylinders today!

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THE NEW YORK AIR BRAKE COMPANY

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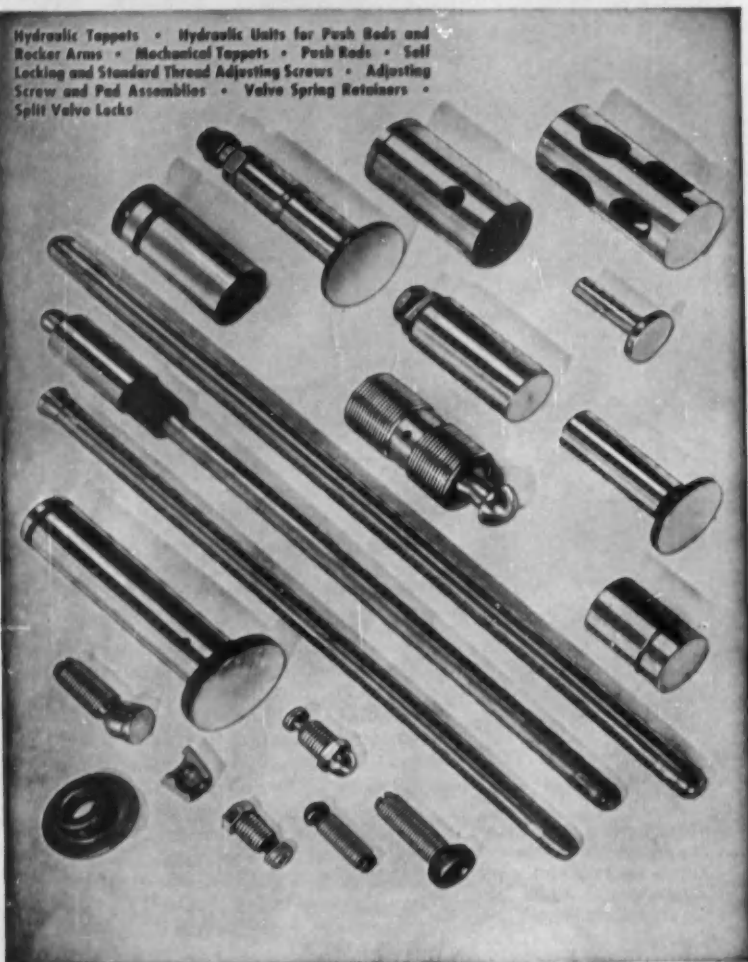


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durable goods and services is likely to increase at least \$3 billion merely to keep pace with the growing population. Even if the income generated from these factors does not produce a derived impact on spending generally, the dollar volume of total output for the economy would equal the year 1953.

In terms of output of final goods for civilian use, the results would be even more impressive. Excluding expenditures for national security and business inventories there would be four per cent more goods and services available for civilian use in 1955 than in the year 1953 or in the second quarter of 1953 which was the peak period for total business activity. Population will have risen only three per cent in the same period.

## Automotive Outlook

Demand for cars and trucks will be stimulated by the higher level of business activity. It should be noted, however, that factory sales of passenger cars to the domestic market of 5.3 million in 1954 were as high as the average for the peak period 1949-53. This figure was exceeded in 1950 and 1953 only because of limited production in the immediately preceding years. To equal or exceed the 1954 figure in 1955 would, therefore, be a substantial achievement.

There is not likely to be any problem of attracting new car buyers as long as their used car trade-ins can be disposed of at current price levels for cars of the same age. The fact that customers in this country have absorbed 31½ million new cars during 1949-54 sets up a potential market for the next six years equal to or better than this figure. Once people have acquired the equity in and ability to finance cars in the age groups presently owned, they are likely to strive to maintain this position as long as their incomes hold even or rise. Sale of another 31½ million cars domestically during 1955-60 (or an average of 5.3 million annually) would be required to maintain the present number of cars six years of age and under. In fact, growth of the adult population and per capita buying power should increase the number of car owners in this age group over the long run.

## New Car Sales

The timing of new car purchases in individual years will depend on general business conditions and new model changes. In 1955, both of these

factors will favor improved demand for new cars. Model changes for the bulk of total car volume will be much more extensive than in most years.

The primary limitation on new car sales will be the ability to move used car trade-ins. The two factors in used car demand—scrappage of older cars and growth of car ownership—would normally be at a somewhat lower level in the next two or three years as compared with 1953-54. The number of prewar (WWII) model cars, which have accounted for the bulk of scrappage, will have been reduced to about 5½ million by the beginning of 1955. The only other cars old enough to disappear rapidly during 1955-57 are the less than 7 million 1946-48 models.

At prewar rates of scrappage for cars in these age groups, nearly 4 million of the prewar models and 3 million of the 1946-48 models would be scrapped during 1955-57. The remaining 1½ million prewar models and 4 million 1946-48 models would represent cars which could still be operated without major repair and whose owners would not pay the price for 1949 and subsequent models. It is possible that the heavy supplies of 1949-51 models at low prices by the end of 1957 will encourage even more scrappage of the pre-1949 models.

It is obvious, however, that the weaker 1949-51 models will have to start disappearing in quantity before 1958 if scrappage is to total even 3½ million a year during the next three years. At prewar rates of the scrappage, nearly 3 million of the 1949-51 models would disappear by the end of 1957. Scrappage of 1952 and subsequent models would be negligible—only 0.8 million—because their market value would still be high enough to warrant substantial repairs.

The other factor in used car demand—growth of ownership—also will be difficult to maintain at recent volumes. Growth in the postwar period has been at an unusually high rate to make up for the shortage of cars existing at the end of World War II. From now on, growth will be more in line with the increase in number of households and in buying power per household.

### Ownership Growth

Greater replacement of old cars and growth of car ownership than indicated by the above factors in the next two or three years can be achieved, however, through increased selling effort and further reduction

(Advertisement)

# GASOLINE or DIESEL?

**Hercules engineers will assist you in the proper selection of the most economical type of engine for your particular equipment.**

Many of our customers have asked us, "Which type of engine would be best for me?" Perhaps this same question has entered your mind at one time or another.

Of course, there are many governing factors which should be considered in selecting the proper type of engine for a particular piece of equipment. First of all, how much horsepower is needed? Is there a type of fuel which costs less locally . . . gas, gasoline, L.P. Gas, kerosene or fuel oil? How much money will be involved in the initial purchase? How much money can you expect to save by using a low-cost fuel? Will it be enough to offset the extra cost of a special type of engine? These and many other questions should be objectively answered before any engine is purchased.

We have no particular cause to champion and do not attempt to take sides or promote the use of one fuel over the other. As you know, we manufacture all types of internal combustion engines to operate on any fuel that is readily available. (Natural gas, L.P. Gas, kerosene, diesel fuel, gasoline, etc.)

The basic Hercules gasoline engines are adapted by minor changes to operate on different spark-ignition fuels. The Hercules diesel engines are compression ignited — specifically designed for operation on diesel fuel.

We have, however, maintained several similarities between the Hercules spark-ignited and the Hercules diesel engines which we think are very important. First of all, gasoline and diesel engines of comparable piston displacement have similar mounting dimensions and operating charac-

teristics. Generally speaking, this makes it possible for equipment to be powered by either Hercules gasoline or diesel engines without creating any major installation problems. Thus, equipment manufacturers are able to supply customers with the proper type of engine to assure "top-notch" economies, according to the customers' operating conditions.

Another similarity between our gasoline and diesel engines, is that they both are of the 4-cycle design. The 4-cycle design is universally accepted and understood. This feature provides for less complicated engine servicing and in addition, service is readily available throughout the country.

What does all this mean to you? Maybe we can sum it up in our motto, "Engine Manufacturing Specialists Since 1915". Actually, we're custom engine builders with manufacturing facilities. Our engineering and sales policy is to design and sell engines to meet the exacting needs of our customers.

As a result, we have 70 basic models of gasoline and diesel engines which range from 3 to 500 H.P. They are available in many different designs . . . vertical and horizontal engines, special fuel handling equipment, various types of flywheels, etc. . . in fact, we probably have an engine that will fit your particular needs to a "T".

Whether it's Agricultural, Oil Field, Automotive, Construction, Industrial, Marine or any other engine application, our engineers will gladly assist you in the proper selection of power for your equipment. Give us the details, so that we understand your problem, and we'll provide the answers to your power problems.



## HERCULES ENGINES

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in the market price for used cars. The pressure of large incoming supplies of used cars traded in for newer cars will probably precipitate such a situation. This pressure might be relieved in part if an unusual number of car buyers become two-car owners for the first time when they find that the value of their present car is not enough to warrant giving it to the dealer as partial payment for a newer one.

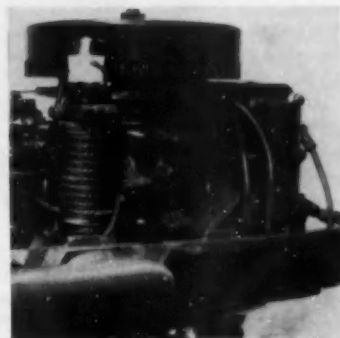
The longer-run outlook for scrappage and growth beyond 1957 is very favorable. Scrappage of the heavy

volume of 1949 and subsequent models will provide a record replacement market for used cars in the latter part of this decade and in the 1960's. Growth in ownership will also be stimulated in this period as the increased number of children born in the 1940's reach adult age and as the expanded highway program encourages car ownership.

The preceding article is a summary of remarks made by the author during a meeting of the Motor and Equipment Manufacturers Association at Chicago on December 7.

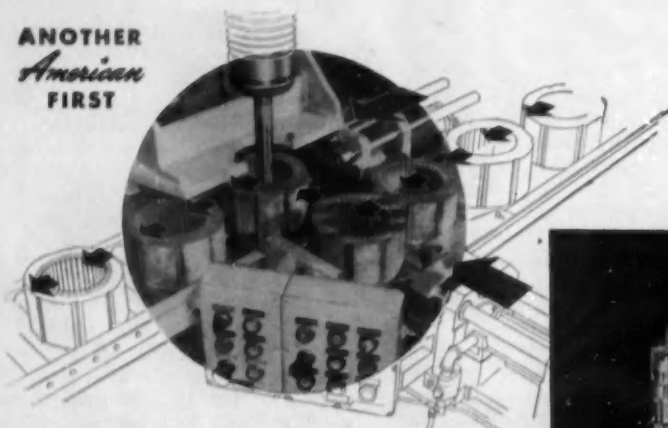
## New Rewind Starter for Outboard Motors

A UNIQUE automatic rewind starter mechanism for use on several of its 1955 Elgin outboard models has been developed by West Bend Aluminum Co. As shown, it consists of a drum attached to the crank case and fitted with a pinion at the top. A spring within the drum rewinds the cord into a spiral groove on the outside of the drum. When the starter is actuated by pulling its handle, a pin



through the starter drum shaft moves the pinion upward through spiral slots in the pinion hub. Further pulling of the starter cord rotates the flywheel through a ring gear at its lower edge. The starter pinion moves downward and out of engagement with the ring gear as the engine starts under its own power.

ANOTHER  
*American*  
FIRST



## ... COMPLETELY AUTOMATED BROACHING

STATOR PARTS BROACHED IN 20 SECONDS



Installed in a conveyor line, this American 3-way broaching machine with a hydraulic broach retriever and electrical controls, broaches the I.D. of stator parts in a 20 second cycle. Parts coming into the machine are automatically shuttled into position, broached, and then discharged back on the conveyor line. Interchangeable broach arbors and broach shells make it possible to broach several different parts of similar size.

BEVEL GEAR BLANKS BROACHED IN 15 SECONDS



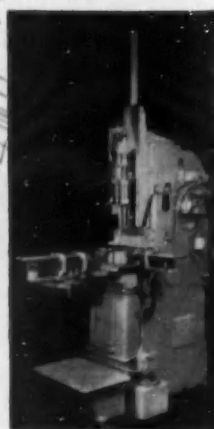
Using tooling similar to that illustrated, an American (PD) pull-down machine, installed in a conveyor line, automatically broaches the I.D. of a bevel gear blank in 15 seconds. By using interchangeable broach arbors and broach shells, over 20 similar bevel gear blanks are broached with this set-up.



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## BOOKS ...


CHROMIUM PLATING, by Paul Morisset, J. W. Oswald, C. R. Draper, and E. Pinner, published by Robert Draper, Ltd., 83/85 Udney Park Road, Teddington, Middlesex, England. Price, \$11.00. It is difficult to imagine a world without chromium plating. Bright chrome has firmly established itself as the most popular of the decorative plated finishes while, in the fields of engineering and industrial chemistry, hard chrome plating is recognized as a means of providing hard, wear resistant and, in some cases, oil-retaining surfaces of high corrosion resistance. Between them, the four authors of this book have combined scholarship and wide bibliographical resources with extensive practical experience of production chromium plating to produce a text which deals with the subject as comprehensively as possible. It discusses not only all aspects of the production, properties and applications of all types of chromium electrodeposits but also the ancillary processes such as polishing, grinding and machining, copper and nickel plating, racking, testing and inspection of deposits, control and analysis of solutions, health hazards, costing and waste disposal.



# CALENDAR

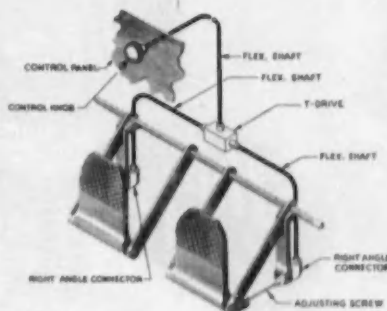
## OF COMING SHOWS AND MEETINGS

- Chicago Automobile Show, Chicago, Ill. ....Jan. 8-16
- American Road Builders' Association, annual meeting and exhibit, Roosevelt Hotel, New Orleans, La. ....Jan. 10-13
- SAE Golden Anniversary Annual Meeting and Engineering Display, Sheraton-Cadillac and Statler Hotels, Detroit, Mich., Jan. 10-14
- Machinery and Allied Products Institute, economic conference, Mayflower Hotel, Wash., D. C., Jan. 14-15
- Forty-fifth Annual National Motor Boat Show, Kingsbridge Armory, New York, N. Y. ....Jan. 14-22
- GM Motorama, Waldorf-Astoria Hotel, New York, N. Y. ....Jan. 20-25
- Plant Maintenance & Engineering Show, International Amphitheatre, Chicago, Ill. ....Jan. 24-27
- National Automobile Dealers Association, annual convention, Conrad Hilton Hotel, Chicago, Ill., Jan. 29-Feb. 2
- Detroit Automobile Show, Detroit, Mich. ....Jan. 29-Feb. 6
- Automotive Accessories Manufacturers of America, annual exposition, Navy Pier, Chicago, Ill. ....Feb. 7-11
- Society of the Plastics Industry, 10th annual Reinforced Plastics Div. conference, Hotel Statler, Los Angeles, Calif. ....Feb. 8-10
- Universal Travel & Auto Sports Show, Madison Square Garden, New York, N. Y. ....Feb. 20-27
- Society of the Plastics Industry of Canada, 13th annual conference, Hotel London, London, Ont., Feb. 22-23
- Pacific Automotive Show, Pan-Pacific Auditorium, Los Angeles, Calif. ....Feb. 24-27
- SAE Golden Anniversary Passenger Car, Body, and Materials Meeting, Sheraton-Cadillac Hotel, Detroit, Mich. ....March 1-3
- National Association of Corrosion Engineers, 11th annual conference and exhibition, Palmer House, Chicago, Ill. ....March 7-11
- SAE Golden Anniversary Production Meeting and Forum, Netherland Plaza Hotel, Cincinnati, O. ....March 14-16
- ASTE Western Industrial Exposition, Shrine Auditorium and Exposition Hall, Los Angeles, Calif. ....March 14-18
- Ninth Western Metal Congress and Exposition, Pan-Pacific Auditorium, Los Angeles, Calif., March 28-April 1
- National Fluid Power Association, annual spring meeting, Colorado Springs, Colo. ....April 5-7
- American Society of Lubrication Engineers, annual meeting and exhibit, Hotel Sherman, Chicago, Ill. ....April 13-15
- SAE Golden Anniversary Aeronautics Meeting, Production Forum, and Aircraft Engineering Display, Hotels Statler and McAlpin, New York, N. Y. ....April 18-21
- International Motor Show, Turin, Italy ....April 20-May 1

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## S.S. WHITE FLEXIBLE SHAFTS ARE THE ANSWER WHEN ADAPTABILITY IS A "MUST"

This schematic drawing shows an aircraft rudder pedal adjusting mechanism which allows the pilot to raise or lower the pedals to a convenient operating level. S.S. White provides the entire control set-up consisting of a hand-wheel, three flexible shafts, a T-drive and two adapters with extension shafts. The simplicity and adaptability of the design result in basic economies in cost, weight and space.



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S.S. White flexible shafts incorporate the latest engineering and technical advancements in flexible shaft design and manufacture. They're a quality product built to measure up to the highest possible performance standards. This is one reason why there is no "or equal" for an S.S. White flexible shaft, and why you can specify them with confidence.

BULLETIN 5304 has basic information and data on flexible shaft application and selection. Send for a free copy. Address Dept. B



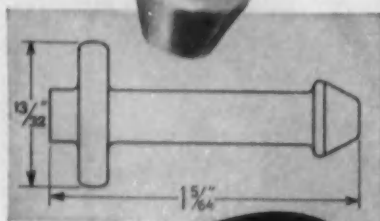
R-7

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SCREW MACHINE	\$14.00 per thousand
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SAVING	\$8.80 per thousand

How about your fasteners or small parts? Have you had an estimate from HASSALL?

This is a typical example of how HASSALL saves thousands of dollars for cost-conscious manufacturers in hundreds of industries. This part is made in one piece by cold heading . . . the part is not only lower in cost but also stronger and just as accurate. Savings amount to \$8.80 per thousand and this manufacturer used hundreds of thousands a year!

Perhaps your parts can be made by this better, lower cost method. Send samples or sketches of your parts for a prompt, \$\$\$ saving quotation.

- Send for 3 color decimal equivalent wall chart.
- On request, our 36-page catalog.



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## ON OUR WASHINGTON WIRE



Armed Forces procurement rules are being revised to assure a nation-wide procurement base for military goods in wartime. A new Defense Dept. directive indicates that buying of military items from sources in a number of geographical areas, rather than from a concentrated group of producers, is contemplated. The directive follows up a recent Office of Defense Mobilization amendment to its Order VII-7. Under its terms, procurement officials may depart from the general practice of awarding contracts to the low bidder when the departure appears the best way of keeping a firm mobilization base.

Results of several years of study of metal failures by the National Bureau of Standards are now available in a new pamphlet entitled "Mechanical Failures of

Metals in Services." Copies are available for 30 cents each from Government Printing Office Washington 25, D. C.

Expenditures for new plant and equipment will continue at a high rate in the first quarter of 1955, although somewhat below the average for the year 1954. According to the latest survey made by Dept. of Commerce and Securities and Exchange Commission, investment in early 1955 is planned by business at a seasonally adjusted annual rate of \$26 billion.

Defense of production centers in the continental U. S. is to be the best that a considerable amount of money will buy. The Pentagon says there will be a bigger outlay for continental defense in the fiscal 1956 military expenditure of about \$35 billion.

## KEEP AN EYE ON ENGINE PERFORMANCE

WITH A

## JONES TACHOMETER



TO CHECK SPEED PERIODICALLY  
TO SHOW SPEED CONTINUOUSLY

Owners and operators of trucks, bulldozers, diggers, and other heavy equipment are using JONES TACHOMETERS to get

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from their heavy duty diesel and gasoline engines. There is a critical point at which an engine gives maximum performance without undue strain or smoking. That point is measured and checked in RPM's by JONES TACHOMETERS, designed for accuracy and shock resistance and preferred by the country's leading truck and engine manufacturers.

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BULLETIN 146G

# JONES MOTROLA CORP.

Stamford, Conn.

# SHORTIES

Although a decrease is noted over the first six months of 1953, automobile theft continues as a major criminal problem in the U. S. During the first six months of 1954, an estimated 110,060 cars were stolen, as compared with 112,600 in the same period of 1953.

A two-lane surface-treated road can be built for about \$15,000 a mile. A deep macadam or concrete road costs \$100,000 a mile. Multi-lane divided highways with only a few entrances and exits cost from \$500,000 to several million dollars a mile, with much of the cost going into bridges, overpasses, and other structures.

Final reports from 940 companies reveal that fringe benefit costs—employer payments for social security, pensions, vacations and the like—amounted to \$720 per employee during 1953.

Forty medium bombers carry a total of 10,000 electronic tubes in their communications, navigation and fire-control systems.

In 1950, when the Korean War started, the U. S. Air Force consisted of only 48 inadequately-equipped wings. Although the nation's air power buildup began at that time, it will be 1957 before the present target—137 wings—is reached.

A new machine developed by an aircraft manufacturer cuts and sizes 11½-in. lengths of .041 gage wire at the rate of one per second. A job that formerly took 452 hours can now be done in 18½ hours.

Every hour, the present-day workman uses machines to turn out goods worth five times as much as those he produced in the same time 95 years ago. During this period the national income has multiplied 30 times.

## For All Tractors

JOHN DEERE



FORD



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MINNEAPOLIS-MOLINE



FARMALL



MASSEY-HARRIS



ALLIS-CHALMERS






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METERING VALVE LP-GAS

## Carburetors

**ENGINEERED** for each engine  
**CALIBRATED** to each engine  
**PRE-SET** to a performance curve

**NOT  
AFFECTED  
BY...**

...TEMPERATURE CHANGES  
 ...HIGH OR LOW ALTITUDES  
 ...CHANGING GAS PRESSURES

**STARTS INSTANTLY** in coldest weather.  
**GIVES INSTANT** power—no choking or fluttering.  
**IDLES PERFECTLY** in all conditions.  
**BALANCES POWER** of each cylinder.  
**NO MULTIPLE ADJUSTMENTS**—tune up only.  
**PERFORMS AT ALL** speeds to pre-set perfection.

CENTURY GAS EQUIPMENT CO., 11188 Long Beach Blvd., Lynwood, Calif.

**B**ABY FORK LIFTS  
TO EARTH-MOVING GIANTS



Use **TUTHILL SPRINGS**  
*designed for the job!*

**FINEST ALLOY  
STEEL LEAF AND  
HELPER SPRINGS**

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**Multiform**  
**STEEL RULE**

**Die's**  
STEEL RULE  
SINCE 1900

LET US SOLVE YOUR  
DIE-CUTTING PROBLEMS  
WITH RICHARDS' "TOUGH TEMPER"  
STEEL RULE CUTTING DIES  
HEADQUARTERS SINCE 1900  
FOR DIES AND DIE MAKING  
EQUIPMENT AND SUPPLIES

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FELT, INSULATION, SEATING, CORK,  
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**J. A. RICHARDS CO.**

903 N. PITCHER  
KALAMAZOO, MICH.

**Safety CONTROLS**  
FOR ENGINES  
**SYNCHRO-START PRODUCTS, INC.**  
8151 N. RIDGEWAY AVE., SKOKIE, ILLINOIS  
See our full page "ad" in the **STATISTICAL ISSUE p. 399**

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SPECIALTIES**

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- STUDS
- SPLINES
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**PITTSBURGH PLUG AND  
PRODUCTS Co. PCH, PA.**

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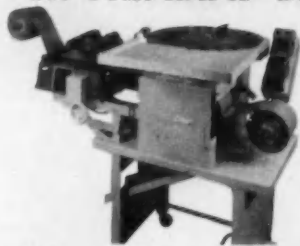
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INDUSTRIES**

is read by general executives,  
production men, engineers, pur-  
chasing agents and others whose  
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who sell to the World's Largest  
Manufacturing Industry.





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AN AUTO-PAK machine with automatic feeding and printing devices.

Eliminate old fashioned manual methods. Package and identify your parts automatically in one operation with PAK-RAPID equipment. Many automotive and aircraft manufacturers use this equipment every day to lower packaging and handling costs.

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Incorporated 1945

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HEATERS

OIL COOLERS

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AUTOMOTIVE, INDUSTRIAL EQUIPMENT, AIRCRAFT, AGRICULTURAL INDUSTRIES AND OTHERS; will boost your output at material savings.

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Serving Industry Since 1914

## A.C.M.I. BORESCOPIES

for close-up visual inspection  
of internal surfaces  
and hidden parts

A.C.M.I. Borescopes permit close-up visual examination of interior areas and surfaces not otherwise visible. They save time and money, and prevent costly dismantling. Each Borescope is a compact, self-illuminated industrial telescope of highest quality, employing a precision optical system, that produces a flat visual field. Lens systems are fully corrected for color, spherical aberrations, and coma, with all lens surfaces coated to increase light transmission. Write for free informational folder, or tell us your problem.

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**American Cystoscope Makers, Inc.**  
1241 LAFAYETTE AVENUE NEW YORK 39, N. Y.

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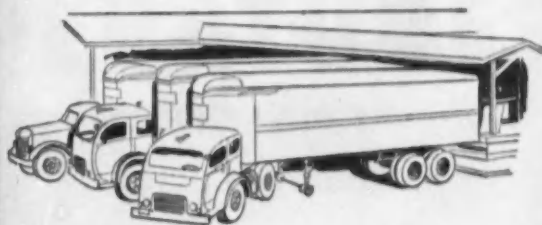
Roy Fruehauf, President, Fruehauf Trailer Company



**NATIONAL BUSINESS PUBLICATIONS, INC.** 1001 Fifteenth Street, N. W., Washington 5, D. C. • STerling 3-7535

*The national association of publishers of 171 technical, professional, scientific, industrial, merchandising and marketing magazines, having a combined circulation of 4,049,550...audited by either the Audit Bureau of Circulations or Business Publications Audit of Circulation, Inc....serving and promoting the Business Press of America...bringing thousands of pages of specialized know-how and advertising to the men who make*

*decisions in the businesses, industries, sciences and professions...pin-pointing your audience in the market of your choice. Write for list of NBP publications and the latest "Here's How" booklet, "How Well Will We Have to Sell Tomorrow?" by Ralston B. Reid, Advertising & Sales Promotion Manager, Apparatus Sales Division, General Electric Company, Schenectady, N.Y.*



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says Mr. Fruehauf. "Frequently I find facts and ideas in business publications that help me to make important decisions. We know our customers and prospective customers read *their* business magazines, too. We carry substantial advertising schedules in several different groups of business periodicals."

*It is good thinking to judge an advertising medium by the value its editorial pages deliver to regular readers. Business publications provide a direct sales route for any product or service of benefit to business or professional men.*

***"7,125 men and women  
signed up to join those  
already saving for their  
financial security..."***

**GEORGE H. COPPERS**

*President,  
National Biscuit Company*



***"There is no greater honor than partnership in an enterprise as important to a nation as the Payroll Savings Plan for United States Savings Bonds. We view our recent person-to-person canvass of employees in behalf of Bonds as practical patriotism. It supports our Government's efforts to stabilize the value of the dollar. The campaign also benefited our employees. 7,125 men and women signed up to join those already saving for their financial security in this easy, automatic way."***

The Payroll Savings Plan is the backbone of Series E Bond Sales. 8,500,000 employees in more than 45,000 companies invest more than \$160,000,000 in Savings Bonds every month.

The person-to-person canvass is the keystone of The Payroll Savings Plan. In company after company person-to-person canvasses conducted by employees have increased participation to 60%, 70%—even 90% plus.

Why don't you conduct a person-to-person canvass in your company? Here are two, simple steps:

- Tell the Savings Bond Division, U.S. Treasury Department, Washington, D.C., you want to conduct a person-to-person canvass, they will show

you how easy it is to install the plan.

- Over your signature tell your men and women you are 100% behind the Payroll Savings Plan because it enables them to build personal security . . . it is a check on inflation and helps to stabilize the dollar . . . it has set up a reservoir of reserve purchasing power—over \$37.5 billion—the cash value of Savings Bonds held by individuals at the end of July, 1954. The greatest reserve of purchasing power this or any other country has ever had.

Your phone call, telegram or letter to Savings Bond Division, U.S. Treasury Department, Washington 25, D.C., will bring prompt co-operation from your State Savings Bond Director. Act today.

*The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and*

**AUTOMOTIVE INDUSTRIES**





# Sensational Piston Performance

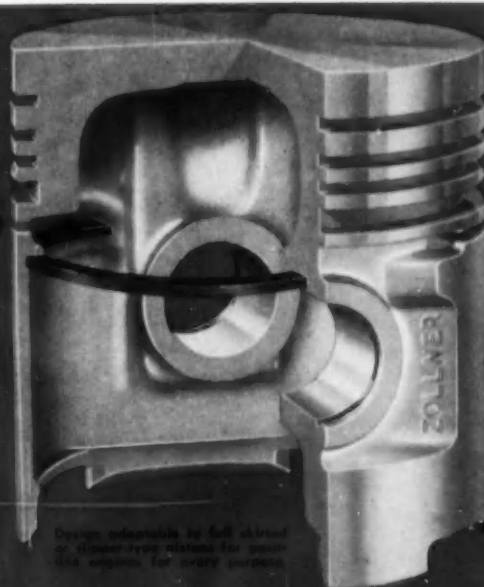
## UNIFORM CLEARANCE AT ALL TEMPERATURES

### STEEL TENSION MEMBER

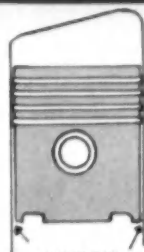
Anchored only at pin bosses  
and cast in positive contact  
with I. D. of piston skirt

Controls Clearance Automatically

ZOLLNER  
CLEAR-O-MATIC  
PISTONS



Now, pistons may be fitted to closer clearances than ever before possible. The sensational development of CLEAR-O-MATIC Pistons by Zollner engineers reduces required clearance to less than .001 with constant uniformity of skirt bearing over the entire temperature range. Performance results are spectacular. Engines run quietly with no cold slap. Friction is reduced without loss of durability or heat conductivity. There is no danger of scuffing or seizing. The Zollner designed steel tension member incorporates in the aluminum piston the same effective expansion as the ferrous cylinder itself. We urge your immediate test of these sensational advantages for your engine.



UNIFORM  
EFFECTIVE SKIRT  
CLEARANCE  
AT ALL  
TEMPERATURES

- 1 Clearance maintained uniformly at all coolant temperatures from 20° below zero to 200° F.
- 2 Effective expansion identical with ferrous cylinder.
- 3 Steel tension member, with same effective expansion as cylinder, maintains uniform skirt clearance through entire temperature range.
- 4 Normal diametric clearance usually less than .001 with uniform skirt bearing.
- 5 Durability and conductivity comparable to heavy duty design.

ZOLLNER

THE ORIGINAL EQUIPMENT PISTONS

PISTONS

# ZOLLNER

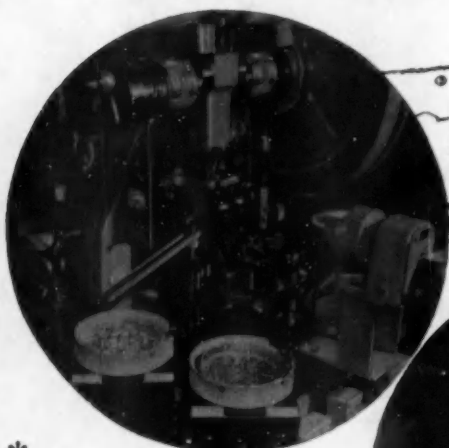
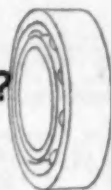
ZOLLNER MACHINE WORKS • Fort Wayne, Indiana

• ADVANCED  
ENGINEERING  
• PRECISION  
PRODUCTION

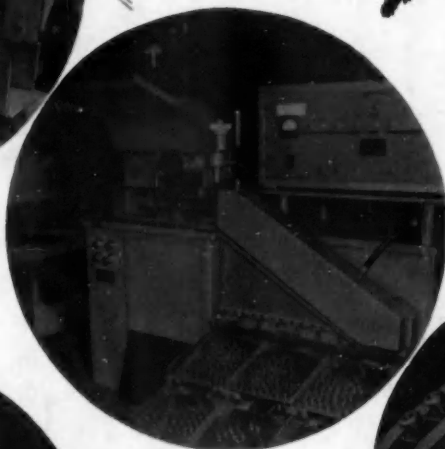
In cooperation with  
engine builders

Blueprints call for bearings?

Call on  
NEW DEPARTURE  
**PDQ\***



**\* PRICE!**—Savings of automation in New Departure plants are reflected in prices impossible with less modern methods. Here a unique machine automatically assembles refrigerator door bearings . . . with notable savings for the buyer.



**\* DELIVERY!**—Electronics work at New Departure! Bearing races are speedily sorted into six dimensional classifications by this machine. Volume is up because New Departure invested in this modern equipment.



**\* QUALITY!**—Painstaking quality control, at every manufacturing step, works to approach perfection in every bearing. Here you see an electronic inspection of operational noise level. Any sub-standard part is automatically rejected. There's no chance for error. You are sure of top quality—every time!



**PLUS ENGINEERING SERVICE**—There's no substitute for experience . . . and New Departure offers you an unmatched backlog of accumulated ball bearing knowledge. So whenever the prints call for ball bearings, check with New Departure for engineering assistance in bearing selection and application. Phone, wire or write . . . you'll get action from New Departure—PDQ!

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT

**NEW DEPARTURE**  
**BALL BEARINGS**



NOTHING ROLLS LIKE A BALL